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# BMJ Open

## Missed Opportunities in Hypertension Screening in Indonesia: Evaluation of Integrated Screening Post Implementation

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## Missed Opportunities in Hypertension Screening in Indonesia: Evaluation of Integrated Screening Post Implementation

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### Abstract

**Objectives:** To assess the implementation and contextual barriers of POSBINDU in Indonesia.

**Design:** This was a concurrent mixed-methods study, with a cross-sectional analysis of secondary data and Focus Group Discussions on stakeholder of POSBINDU.

**Setting:** The study was conducted in seven districts in three provinces in Indonesia, with approximately 50% of the primary health care (PHC) were selected as areas for data collection (n PHC=100).

**Participants:** From 475 POSBINDU, we collected secondary data from 54,224 participants. For the qualitative approach, 21 focus group discussions (FGDs) and 2 in-depth interviews were held among a total of 223 informants.

**Primary outcomes and measures:** Proportion of POSBINDU visitors getting the hypertension screening and risk factors' assessment, and barriers of POSBINDU implementation.

**Results:** Out of the 114,581 POSBINDU visits from 54,224 participants, most (80%) were female and adults over 50 years old (50%) showing a suboptimal coverage on male and younger adults. Approximately 95.1% of visitors were measured for blood pressure in their first visit; 35.3% of whom had elevated blood pressure. Less than 25% of the visitors reported to be interviewed for risk factors during their first visit, less than 80% had anthropometric measurements, and less than 15% had blood cholesterol examinations. We revealed lack of resources and limited time to perform the complexities of activities and reporting as main barrier for effective hypertension screening in Indonesia.

**Conclusions:** This study showed missed opportunities in hypertension screening in Indonesia. The barriers include a lack of access and implementation barriers (capability, resources, and protocols).

Keywords Noncommunicable diseases, hypertension, screening, community-based

### Article Summary

#### Findings

In a mixed-methods study, we found missed opportunities in hypertension screening in Indonesia. Several barriers include suboptimal coverage, complexities of activities and overlap between different NCD-related programs, and lack of resources.

#### Implications

1  
2  
3 There is a need to improve coverage and implementation of hypertension screening. An integrated  
4 approach to improve the implementation of hypertension screening, from guidelines to practice is  
5 crucial.  
6

### 7 **Strengths and Limitations of this study**

- 9 • The strength of this study was the relatively large evaluation of POSBINDU using a mixed-methods  
10 study design. Hence, providing more comprehensive information on POSBINDU implementation.
- 11 • The study limitation includes the difficulty in differentiating whether the missed reporting was  
12 due to lack of activities or lack of reporting.
- 13 • Nevertheless, both the activities and reporting are important in NCD screening, particularly in the  
14 follow up.  
15  
16

### 17 **Introduction**

18 The increasing trends of Non-Communicable Diseases (NCDs) in the world, including Indonesia,  
19 require targeted and specific primary and secondary prevention.[1,2] Hypertension, one of the most  
20 common NCDs, has a relatively high (33.4%) prevalence in Indonesia.[3,4] These figures are estimated  
21 to increase even further with the changing (more sedentary) lifestyle, unhealthy diet, rising prevalence  
22 of obesity, and the increasing life expectancy.[5] In 2015, hypertension attributed to 41% of all  
23 disability-adjusted life-years (DALYs), and was the leading risk factor for cardiovascular diseases.[6]  
24 Economically, hypertension is accounted for \$370 billion in medical costs per year worldwide.[7]  
25 Major modifiable risk factors for NCDs include smoking, alcohol consumption, unhealthy diet and  
26 obesity, and a sedentary lifestyle.[8,9] With the heavy burden and the economic cost of this disease,  
27 primary and secondary prevention for hypertension and its risk factors become very important.  
28  
29

30 In 2010, the WHO has recommended the implementation of Package of Essential Interventions for  
31 Non-Communicable (PEN) Diseases for low-middle income countries.[10] In response, the Ministry of  
32 Health (MOH) launched the Integrated Health Post (POSBINDU), as part of the PEN program in  
33 Indonesia. POSBINDU, a community-based program in hypertension screening and prevention[11],  
34 was added to the several existing NCD-related programs Indonesia. These include Prolanis (Program  
35 Pengendalian Penyakit Kronis), a community-based hypertension and diabetes management program  
36 affiliated with primary care[12] and Posyandu Lansia, a community-based NCD screening and  
37 management for the elderly.[13] Despite these efforts, the awareness and control of hypertension are  
38 still relatively low: only 25% of people with elevated blood pressure are aware of their condition, and  
39 only 54% of people diagnosed with hypertension take routine medication.[4,14,15] These conditions  
40 are still below the “rule of halves” for hypertension management, which recommends that 50% of  
41 hypertension patients be aware of their condition, with half of whom should be treated.[16,17]  
42  
43

44 A process evaluation is important in assessing the implementation, to identify barriers, and provide  
45 specific recommendations for improvement of POSBINDU. Previous studies have evaluated the  
46 effectiveness of the POSBINDU implementation.[11,18] However, they were lacking on the evaluation  
47 of contextual barriers in POSBINDU implementation. This study aims to portray the implementation  
48 of POSBINDU and its contextual barriers, to provide recommendations for better hypertension  
49 screening, and optimal linkage to care in Indonesia.  
50  
51

### 52 **Methods**

#### 53 **Setting**

54 POSBINDU is a community-based activity run by community health cadres (volunteers) and supervised  
55 by primary health care (PHC) officials. POSBINDU aims to empower communities in screening for NCDs  
56 and the risk factors, targeting individuals above 15 years old, particularly those of productive  
57  
58  
59  
60

1  
2  
3 age.[19,20] The main activities include screening for NCDs (mainly hypertension and diabetes) and the  
4 risk factors (i.e., smoking, diet, physical activity, obesity). Further, POSBINDU also provides health  
5 education and facilitate referral to PHC.[19]  
6

### 7 8 Study Design

9 This was a concurrent mixed-methods study in seven districts in three provinces in Indonesia (Central  
10 Java, East Java, and North Sumatra). We purposely selected provinces with relatively high prevalence  
11 of NCD based on a national health survey conducted in 2018.[21]  
12

### 13 Ethnical approval

14 The study was approved by the ethical review board at Universitas Gadjah Mada (Ethical Clearance  
15 Number KE/FK/0648/EC/2019). The participants of Focus Group Discussion gave informed consent  
16 before participating in this study.  
17

### 18 Data Collection

19 Within every one of the three provinces, we selected two districts: one city representing urban  
20 communities, and one district representing rural communities. In Central Java, an additional city was  
21 also selected. For each district, approximately 50% of the primary health care (PHC) were selected as  
22 areas for data collection (n PHC=100). Within the PHC, we collected data for quantitative process  
23 evaluation from all active POSBINDU in the areas (n POSBINDU=475). In most POSBINDU,  
24 online/electronic data were not available; Hence, data on participation were manually collected from  
25 the POSBINDU register. Data from 2018-2019 were collected, except for Central Java, in which data  
26 were available through September 2019. For the qualitative approach, 21 focus group discussions  
27 (FGDs) and 2 in-depth interviews were held among a total of 223 informants: 22 from Districts Health  
28 Department, 101 from Primary Health Care (PHC) facilities and 100 from POSBINDU cadres. The size  
29 of the FGDs was on average 10 (min 4, max 18). Verbatim transcripts of the FGD's were made for  
30 qualitative analyses.  
31  
32  
33  
34

### 35 Outcome

36 Missed opportunities in hypertension screening was quantified by the proportion of POSBINDU  
37 visitors getting the risk factors anamnesis, and measurement of anthropometric, blood pressure and  
38 cholesterol. We further explored the barriers of POSBINDU implementation using a qualitative  
39 approach.  
40

### 41 Analyses

42 Statistical analyses were conducted using STATA, to calculate the proportion of activities and  
43 outcomes. We further conduct Chi-square, T-test, and ANOVA to assess the statistical significance of  
44 the differences. Content analysis was applied for the qualitative data to ascertain barriers for the  
45 POSBINDU implementation in Indonesia by two independent researchers. Parallel analyses were  
46 conducted to synthesize the findings from the quantitative and qualitative approaches.  
47  
48

### 49 Patient and Public Involvement

50 Patients or the public were not directly involved in the design, or conduct, or reporting, or  
51 dissemination plans of our research.  
52  
53  
54

### 55 Results

#### 56 Participation of community for hypertension screening in POSBINDU

57 Data from 114,581 POSBINDU visits (54,224 participants) were analyzed. The findings showed similar  
58 patterns in the districts and provinces: more female and elderly participants. Approximately 80% were  
59  
60

female participants, with the highest proportion of female participants in rural North Sumatra (95.5%). Meanwhile, in Java, a higher proportion of female participants were observed in urban areas (Table 1).

Table 1. Characteristics of POSBINDU Participants within the Three Provinces in Indonesia (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total
	Rural	Urban	Rural	Urban	Rural	Urban	
Number of individuals	5,103	23,053	10,999	4,983	3,398	6,688	54,224
Number of PHC	11	23	29	9	11	17	100
Number of POSBINDU	38	283	38	27	27	62	475
<b>Categorical (% , SE)</b>							
Female	95.5 (0.3)	71.3 (0.4)	76.2 (0.3)	86.7 (0.5)	73.7 (0.8)	88.2 (0.4)	79.4 (0.2)
Age							
15-24	8.7 (0.4)	6.1 (0.3)	6.2 (0.2)	7.8 (0.4)	13.3 (0.7)	3.8 (0.3)	6.7 (0.1)
25-40	26.7 (0.7)	14.9 (0.4)	20.6 (0.3)	32.2 (0.7)	34.3 (1.0)	17.0 (0.6)	22.2 (0.2)
40-49	20.3 (0.6)	20.1 (0.4)	21.7 (0.3)	22.9 (0.6)	22.1 (0.8)	22.3 (0.6)	21.5 (0.2)
50-59	21.8 (0.6)	27.6 (0.5)	23.9 (0.3)	21.6 (0.6)	21.4 (0.8)	32.0 (0.7)	24.8 (0.2)
>60	22.4 (0.6)	31.3 (0.6)	27.6 (0.3)	12.5 (0.5)	8.9 (0.6)	24.9 (0.6)	24.7 (0.2)
Number of visits							
1 time	87.0 (0.4)	77.4 (0.3)	68.4 (0.3)	65.6 (0.7)	84.5 (0.6)	56.4 (0.6)	71.24 (0.1)
2-6 times	12.9 (0.5)	21.7 (0.3)	21.1 (0.2)	23.9 (0.6)	13.3 (0.6)	35.1 (0.6)	22.0 (0.1)
7-12 times	0.1 (0.0)	0.6 (0.1)	6.3 (0.2)	6.0 (0.3)	2.1 (0.2)	5.9 (0.3)	5.3 (0.1)
>12 times	0 (0.0)	0.2 (0.1)	4.1 (0.1)	4.5 (0.3)	0.1 (0.0)	2.6 (0.2)	1.4 (0.1)
<b>Continuous (mean, SE)</b>							
Age	46.4 (0.2)	51.7 (0.2)	49.7 (0.1)	43.4 (0.2)	41.0 (0.3)	50.4 (0.2)	48.6 (0.8)
Number of visits	1.2 (0.8)	1.4 (0.1)	2.5 (0.2)	2.7 (0.5)	1.4 (0.2)	2.5 (0.3)	2.1 (0.1)

Despite the relatively high missing information on age (n missing= 12,084, or 22.3%), we found that the participants were on average of older age, with roughly 50% of participants aged over 50 years old (Table 1). The highest proportion of participants >60 years old were observed in rural East Java (31.3%), with mean age of 51.7 years old. We measured the youngest POSBINDU participants in rural Central Java (mean age 41.0 years old).

In the span of the two years of secondary data collection, we found that, on average, the participants visit POSBINDU twice, with the lowest average of visits in North Sumatra (rounded to 1 visit/participant). Approximately 38,628 (71.2%) of participants visit POSBINDU once for two years, and 761 (1.4%) visits POSBINDU more than 12 times.

Table 2. Missed Opportunity in Hypertension Screening and Risk Factors Characteristics within POSBINDU Participants (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total
	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	

Missing Information in  
All Visits

N	6,061	15,774	57,504	13,422	4,925	16,895	114,581
Personal history (complete)	99.3 (0.1)	92.6 (0.2)	67.9 (0.2)	42.5 (0.4)	62.1 (0.7)	95.2 (0.2)	73.8 (0.1)
Family history (complete)	99.4 (0.1)	92.6 (0.2)	65.1 (0.2)	39.7 (0.4)	61.6 (0.7)	95.9 (0.2)	72.1 (0.1)
Personal history (any)	88.2 (0.4)	88.5 (0.3)	56.4 (0.2)	17.2 (0.3)	54.2 (0.7)	91.0 (0.2)	62.9 (0.1)
Family history (any)	97.5 (0.2)	88.9 (0.3)	57.3 (0.2)	28.9 (0.4)	53.5 (0.7)	93.8 (0.2)	65.7 (0.1)
Height	42.7 (0.6)	19.0 (0.2)	15.6 (0.2)	20.7 (0.3)	30.6 (0.7)	23.3 (0.3)	19.9 (0.1)
Weight measurement	35.8 (0.6)	16.0 (0.2)	18.8 (0.2)	5.6 (0.2)	8.9 (0.4)	12.3 (0.3)	16.4 (0.1)
Waist circumference	49.5 (0.6)	36.0 (0.3)	15.6 (0.2)	12.7 (0.2)	36.9 (0.6)	63.6 (0.4)	27.8 (0.1)
Blood pressure	1.8 (0.2)	5.8 (0.2)	9.8 (0.1)	4.6 (0.2)	4.2 (0.3)	6.3 (0.2)	7.4 (0.1)
Blood cholesterol	87.0 (0.4)	80.1 (0.3)	81.9 (0.2)	97.4 (0.1)	91.1 (0.4)	82.0 (0.3)	84.2 (0.1)

Missing Information in  
First Visits

N	5,103	23,053	10,999	4,983	3,398	6,688	54,224
Personal history (complete)	99.2 (0.1)	89.9 (0.3)	72.8 (0.3)	35.1 (0.7)	49.3 (0.9)	92.6 (0.3)	76.3 (0.2)
Family history (complete)	99.3 (0.1)	89.8 (0.3)	71.3 (0.3)	41.4 (0.7)	50.9 (0.9)	93.5 (0.3)	76.4 (0.2)
Personal history (any)	88.2 (0.5)	85.1 (0.3)	58.3 (0.3)	15.3 (0.5)	40.1 (0.8)	86.9 (0.4)	68.3 (0.2)
Family history (any)	97.3 (0.2)	85.2 (0.3)	60.6 (0.3)	30.0 (0.6)	40.1 (0.8)	90.5 (0.4)	65.0 (0.2)
Height	41.8 (0.7)	19.0 (0.4)	14.8 (0.2)	21.1 (0.6)	20.4 (0.7)	23.0 (0.5)	20.1 (0.2)
Weight	35.3 (0.3)	15.0 (0.3)	16.7 (0.2)	47.6 (0.3)	7.2 (0.4)	12.9 (0.4)	15.9 (0.1)
Waist circumference	48.9 (0.7)	33.6 (0.4)	11.1 (0.2)	12.9 (0.5)	23.0 (0.7)	66.1 (0.6)	26.9 (0.2)
Blood pressure	1.7 (0.2)	5.4 (0.2)	4.9 (0.1)	5.0 (0.3)	3.2 (0.3)	7.0 (0.3)	4.9 (0.1)
Blood cholesterol	86.1 (0.5)	75.7 (0.4)	76.6 (0.3)	97.9 (0.2)	92.3 (0.4)	79.1 (0.5)	80.6 (0.2)

Risk Factors Screening  
in All Visits

BMI							
Normal	48.3 (0.9)	48.2 (0.5)	51.3 (0.2)	44.6 (0.5)	52.3 (0.9)	46.4 (0.4)	49.3 (0.2)
Underweight	4.9 (0.4)	4.5 (0.2)	8.0 (0.1)	4.5 (0.2)	9.1 (0.5)	3.8 (0.2)	6.3 (0.1)
Overweight	31.9 (0.8)	34.4 (0.4)	30.8 (0.2)	34.7 (0.4)	29.1 (0.8)	34.2 (0.4)	32.3 (0.2)
Obese	14.9 (0.6)	12.9 (0.3)	10.0 (0.3)	16.3 (0.4)	9.4 (0.5)	15.7 (0.3)	12.1 (0.1)
Hypertension	35.4 (0.6)	28.0 (0.4)	42.5 (0.2)	33.7 (0.4)	25.6 (0.6)	35.9 (0.4)	37.2 (0.1)

Risk Factors Screening  
in First Visits

BMI							
Normal	49.3 (0.9)	48.0 (0.5)	51.5 (0.4)	45.3 (0.8)	52.4 (1.0)	44.4 (0.7)	49.3 (0.2)
Underweight	4.8 (0.4)	4.5 (0.2)	7.7 (0.2)	5.1 (0.4)	10.1 (0.6)	4.2 (0.3)	6.3 (0.1)
Overweight	32.0 (0.9)	34.2 (0.5)	30.4 (0.3)	33.3 (0.8)	28.7 (0.9)	35.1 (0.7)	32.0 (0.2)
Obese	13.9 (0.6)	13.3 (0.4)	10.4 (0.2)	16.3 (0.6)	8.8 (0.5)	16.3 (0.5)	12.4 (0.2)
Hypertension	34.5 (0.7)	28.5 (0.4)	40.5 (0.3)	31.6 (0.7)	25.1 (0.8)	37.9 (0.6)	35.3 (0.2)

Within province, rural-urban comparisons are significant at 0.05

Between provinces comparisons are significant at 0.05

We further observed the relatively high missing information for hypertension screening across the districts, with the following general pattern; First, a relatively high proportion of missing information concerning the personal and family history, with East Java having the lowest proportion. Second, a



relatively lower missing data on anthropometric measurements (less than 50%). Third, we found the highest proportion of available data for blood pressure measurements in all the seven districts. Last, our analysis identified higher missing values for blood cholesterol measurements (84.2%). For all measurements, there were significant differences between the three provinces, as well as between the rural and urban areas within the provinces (Table 2).

Based on available data, we found that obesity seems to be more prevalent in urban areas in Java, but relatively similar in North Sumatra. In contrast, hypertension was more prevalent in a rural area for East Java and North Sumatra but was more common in urban districts of Central Java (Table 2). However, these data should be interpreted cautiously due to the relatively high missing data on the measurements.

#### Barriers for the screening of hypertension in POSBINDU

The qualitative data supported the quantitative finding about lacking participation of male and younger population to POSBINDU. In the FGDs, cadres and health officials stated the barriers for male and younger participants to attend POSBINDU, including the inconvenience of POSBINDU schedule, as well as low awareness for hypertension screening (Table 3).

Table 3. Qualitative analyses of Focus Group Discussion amongst POSBINDU Cadres, Primary Health Care and Health Department Officials

Themes	Category	Codes
Suboptimal target population and gap in policy	Participants' characteristics	Younger adults rarely participate
		Lack of male participants
	Barrier to participations	Schedule incompatibility
		Low awareness for screening
		Lack of role model for screening
	Ineffective policy and coordination	Lack of prioritization for NCD
		Implementation gap of national policy/program at the local level
		The need for coordination with different stakeholders
		The need for coordination among NCD-related programs
	Lack of human resources in terms of capability and quantity for hypertension screening	Cadres have multiple tasks, with time constraints
Cadres are volunteers with other obligations		
Cadres' competencies		Lack of knowledge on hypertension and other NCD
		Lack of ability to conduct measurements and provide health education
		Lack of ability to conduct recording and reporting
Lack of NCD program officers for supervision and reporting		Lack of NCD program officers at PHC
		Most program officers are responsible for multiple tasks/programs
		Lack of reporting officers
Provision of Referral Counselling		The participant with hypertension is not always referred to PHC

		Lack of counseling to participants before the referral made
		POSBINDU has referral form, but rarely used
		Treatment for the referral is covered by their health insurance
Lack of resources for hypertension screening and prevention	Equipment for hypertension screening	The equipment is sometimes incomplete
		Equipment maintenance is inadequate
		Limited logistics for cholesterol measurement
	Lack of budget	POSBINDU is funded by the government, stakeholder (private sectors) or community
		Lack of budget for POSBINDU activities
		Lack of budget for cadres training and incentives
	Health education material	Lack of health education materials
	Infrastructure for recording and reporting	Not all cadres have laptops
		Limited internet connection in some areas
Most POSBINDU stations use manual reporting		
Time constraints for implementation based on MOH standard	The complexity of activities and time limitation	The time required for examination is too long
		Too many information needs to be asked and filled out
		The referral form is rarely used
	The complexity of reporting forms	Many forms need to be filled, while time is limited
		A simplified form in checklist format is preferred

The need for role model from community leader to improve participation and the barrier for participation, particularly among males is highlighted by these quotes:

*“ Yes, we don’t have a lot of men (participants), because they are working “ (Cadre, FGD#21)*

*“ In our POSBINDU, the awareness for early screening is still low. Only several people come (to POSBINDU), younger people don’t want to come because (POSBINDU is conducted) during working days “ (Cadre, FGD#3)*

*“ ...Socialization for this (hypertension screening) is needed, often, the community leader in our area don’t want to participate because they are afraid to be screened” (Cadre, FGD#2)*

Lack of priority and overlap of NCD-related programs also contribute to a suboptimal target population of POSBINDU, as illustrated by the following quote:

*“ (NCD) is not a priority program, hence, there’s a lack of commitment between the superior (health department) with the program officials, for example.” (Health official, FGD#7)*  
*“...(different department in) the Ministry of Health focus on specific diseases, such as diabetes and cancer... However, in the community, (the programs) become general. (We) run Polindes, (Posyandu) Lansia, POSBINDU, School Health Program. In my opinion, the regulation is rigid and detailed, but the implementation is mixed (overlap). If we want to give optimum results, it takes efforts.” (Health official, FGD#10).*

Several barriers for implementation were revealed. The cadres and health officers often have to run several different programs. The FGDs also revealed a lack of capability of cadres to conduct

1  
2  
3 measurements for hypertension screening, providing health education, and also conducting the  
4 recording and reporting of the POSBINDU activities and measurements. The informants also  
5 mentioned a lack of resources, including budget, equipment, and logistics to conduct all the  
6 measurements.  
7

8  
9 *“ One person can hold 5 positions in PHC activities... POSBINDU cadres, Posyandu Lansia cadres,  
10 and other programs.. ” (Cadre, FGD#11)*

11  
12 *“ (cadres of) Posbindu do not have laptop nor cell phone for the reporting application (of  
13 POSBINDU), hence, we report to PHC manually” (Cadre, FGD#14)*

14  
15 The barriers also include the complexities of the activities and measurements, as well as extensive  
16 reporting forms, which require a long time to be completed.

17  
18 *“ ...it takes a long time, because of the measurements and stages (of POSBINDU activities) ” (PHC  
19 officer, FGD#8)*

20  
21 *“ ...POSBINDU report is too time-consuming, because it is long (detail), including identity, cell  
22 phone number, address, and others... and it has to be filled out every month.” (PHC officer,  
23 FGD#6)*

24  
25 Interestingly, in several districts, we found the implementation of mobile POSBINDU, moving from  
26 one community to the other within the same subdistricts.

27  
28 *“Our POSBINDU is mobile, we have ten communities, so every week, we move from one  
29 community to the next, focusing on people 15-59 years old.” (Cadre, FGD#18)*

30  
31 We further synthesized the quantitative and qualitative results. We categorized the barriers into three  
32 main parts: 1) input, reflecting the target population/coverage of POSBINDU, 2) process, describing  
33 the implementation of POSBINDU activities, and 3) output, reflecting the recording and reporting  
34 process of POSBINDU (Figure 1). Results show that in both approaches we found lacking participation  
35 of male and younger people in POSBINDU. Lack of priority for NCD screening and ineffective  
36 coordination among stakeholders, combined with lack of awareness and access might attribute to this  
37 finding. The high missed opportunity, particularly in history taking and measurements, were likely due  
38 to the complexity of the activities/measurements, as well as lack of resources. The high missing data  
39 also stem from the complexity of the forms and lack of capability for online reporting.  
40  
41

42  
43 Insert Figure 1 here

#### 44 45 Discussion

46 In this study, we revealed missed opportunities in input, activities, and output of POSBINDU  
47 implementation. Several contextual barriers were identified. The suboptimal coverage was possibly  
48 due to lack of priority for NCD screening, lack of awareness and access, and overlap of NCD-related  
49 program. The suboptimal activities and reporting were likely caused by a lack of resources, as well as  
50 limited time to perform the complexities of activities and reporting according to MOH guideline.  
51

52  
53 The missed opportunity to screen male and younger population that we found in this study is  
54 particularly concerning. Although the prevalence is lower than of the older population, hypertension  
55 prevalence among young Indonesian is still relatively high (28%).[22] While the target population of  
56 POSBINDU is listed as those 15 years or older, the elderly are usually targeted in Posyandu Lansia, a  
57 community-based screening and management for the elderly population.[23] Awareness is also lower  
58 in male and younger adults, signaling the need to screen this population.[3] Ideally, POSBINDU  
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60

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3 becomes the “gatekeeper” for screening in the community. Hypertensive and diabetic patients were  
4 then referred to PHC and joined Prolanis, a community-based activity funded by the health insurance  
5 program, for management of chronic diseases patients.[12]  
6

7  
8 Furthermore, with a lack of male participation, POSBINDU is missing one of the key target populations  
9 for risk factors screening: smokers. Analysis of a national survey in 2014 reported 32% prevalence of  
10 smoking, with approximately 40% of males aged 15-55 years old and 14% of male adolescents are  
11 current smokers.[24–26] Further, 20% of Indonesia’s total chronic diseases are attributed to smoking,  
12 with hypertension as the highest proportion.[27] Screening for hypertension and its risk factors  
13 earlier, combined with lifestyle-based interventions effectively avoid future complications.[28,29]  
14

15  
16 We also revealed the need to prioritize and reorganize the current NCD-related programs, to address  
17 the suboptimal coverage and the overlap. An example of the gap between the national  
18 recommendation and local implementation is reflected in the coordination of existing NCD-related  
19 programs: POSBINDU, Posyandu Lansia, and PANDU PTM. In the MOH, the PANDU PTM and  
20 POSBINDU are regulated under the Directorate for Disease Management, while Posyandu Lansia is  
21 under the Directorate of Public Health. Despite the different directorates, the implementation at  
22 community level is often conducted simultaneously and often overlap. Reporting, however, is  
23 conducted separately. Hence, as previous studies have noted, we also recommend the need of  
24 comprehensive and coordinated NCD prevention program in Indonesia.[30–32]  
25  
26

27  
28 The relatively high missed opportunity in hypertension screening portrays suboptimal implementation  
29 of POSBINDU. This can be caused by a lack of recording and reporting (monitoring and evaluation  
30 fidelity) or lack of measurement (implementation fidelity). Lack of human resources might contribute  
31 to the suboptimal implementation of POSBINDU. Our findings revealed the need to train cadres to  
32 improve their skills and efficiency in conducting the measurements and history taking. This is in line  
33 with findings from Meinema et al (2017 and Abdell-All et al (2018)[33,34]. Our findings also imply the  
34 complexities of the activities and reporting of POSBINDU which lead to ineffective implementation. It  
35 is important to ensure that valuable screening information can be recorded and followed up, for better  
36 intervention. A simplified screening program with integrated reporting is needed.  
37

38  
39 In this study, we also discovered lack of financial and equipment as barrier to POSBINDU  
40 implementation. The integration of POSBINDU and PANDU PTM to the national health insurance  
41 scheme might be important to ensure the sustainability of funding for the program. Integration of  
42 POSBINDU into the national health insurance can also improve participation of the working  
43 population, most of whom are covered by the national health insurance.[35] Previous studies have  
44 reported an increase in uptake of service by health insurance membership.[36–38]  
45

46  
47 Based on our findings, we identified two main areas that needs to be improved: coverage and  
48 implementation of POSBINDU. To improve coverage of POSBINDU, there are two important steps that  
49 we recommend. First, an integrated approach with collaboration amongst different programs and  
50 directorates to reduce the overlap and simplify the POSBINDU implementation at the PHC and  
51 community level. PANDU PTM as the adaptation of WHO PEN,[39] needs to be implemented in a  
52 wider scale. Second, redirecting the target population of hypertension screening, to cover also  
53 younger and male population. A workplace-based screening program which can address the barriers  
54 identified in the qualitative findings is recommended.[40,41] For this younger population, the use of  
55 mobile technology for monitoring of risk factors and measurement might be effective. Previous  
56 studies have reported the effectiveness of mobile health for hypertension screening and risk  
57 stratification.[42,43]  
58  
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To improve the implementation and components of POSBINDU activities, a simplified algorithm to screen and refer the target population is needed. The algorithm needs to be developed both in the electronic format and manual format to address the different capabilities of community cadres and resources in the community. Simplifying the program and reporting systems will also reduce the workload of PHC and district health officials. Further, a clear algorithm for the management of “screened” cases to PHC is important. The readiness of the PHCs also needs to be improved to adequately manage the potential surge in referred cases. Lastly, there is a need to integrate hypertension and NCD screening program into the national health insurance system. Hence, ensuring the sustainability of funding and resources of the program. With these approaches, comprehensive screening for hypertension and NCD along the continuum of care might be more effective.

This study has several limitations. First, the proportion of our measures are not reflective for the whole target population of POSBINDU, since the participants were mostly female and of older age. The characteristics of our sample, which are generally older with a higher proportion of females, drive the proportion higher than that of the general population in Indonesia. However, this study reflects the current participants of POSBINDU. Second, we used a secondary data collection by POSBINDU cadres, the missingness that we presented in this study probably stem from two main sources: lacking in reporting or a true lack in measurement/activities. Nevertheless, both the activities and reporting are important in NCD screening, particularly in the follow-up.

Despite the limitation, there are several strengths of the study: First, to our knowledge, this was the first relatively large evaluation of POSBINDU. Second, the use of a mixed-methods study design. Therefore, providing more comprehensive information on POSBINDU implementation. Third, the study also investigates the contextual factors that should be addressed in the improvement of the community-based hypertension screening program in Indonesia.

### Conclusion

This study showed the missed opportunities of POSBINDU for hypertension screening in Indonesia. The barriers include a lack priority for NCDs, lack of awareness and access for subpopulation, and several implementation barriers: capability, resources, and protocols. An innovative approach to simplify and improve the capacity of POSBINDU is in preparation to optimize the screening and linkage to care of hypertension in Indonesia. This study provides evidence-based recommendations in improving the current implementation of POSBINDU, in the Indonesian context.

### Data Statement

The de-identified data from this study is available upon request to the corresponding or first author pending thorough review of request and adherence to the Indonesian government regulation on data sharing.

### Author Contributions

VW, AP, RFP, EP, YM, JK and JLD contributed in the design of the study. VW, A, RFP, EP, YM, B, and M participate actively in study implementation, including in data collection. VW, YM, S, and RFP analyzed the quantitative data. AP, EP, and B analyzed the qualitative data. VW, AP, RFP, S, and YM draft the manuscript with all co-authors revised critically. All authors read and approved the final manuscript.

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### Conflict of Interest

None declared

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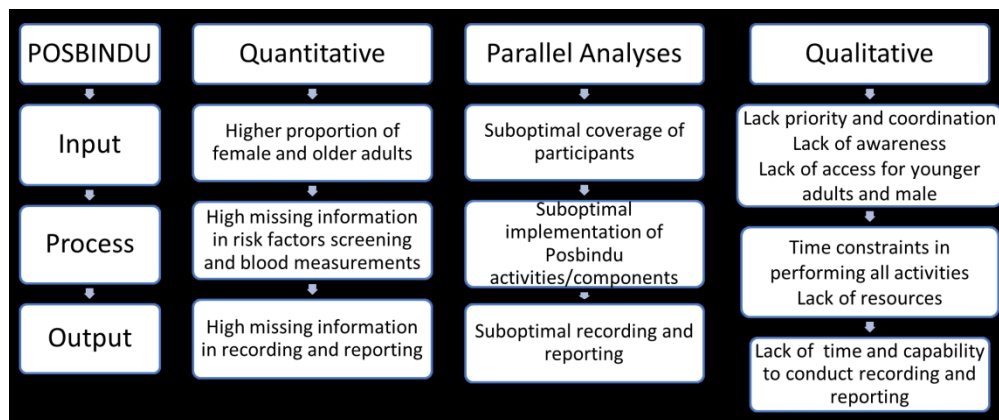


Figure 1. Synthesis of the Quantitative and Qualitative Findings

# BMJ Open

## Missed Opportunities in Hypertension Risk Factors Screening in Indonesia: A Mixed-methods Evaluation of Integrated Health Post (POSBINDU) Implementation

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## 1 Missed Opportunities in Hypertension Risk Factors Screening in Indonesia: A Mixed-methods 2 Evaluation of Integrated Health Post (POSBINDU) Implementation

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11 Phone: (0271) 646994 **Abstract**

12 **Objectives:** To assess the implementation and contextual barriers of POSBINDU, a community-based  
13 activity focusing on screening of Non-Communicable Diseases (NCDs), mainly hypertension and  
14 diabetes, in Indonesia.

15 **Design:** This was a concurrent mixed-methods study, with a cross-sectional analysis of secondary data  
16 and Focus Group Discussions on stakeholder of POSBINDU.

17 **Setting:** The study was conducted in seven districts in three provinces in Indonesia, with  
18 approximately 50% of the primary health care (PHC) were selected as areas for data collection (n  
19 PHC=100).

20 **Participants:** From 475 POSBINDU sites, we collected secondary data from 54,224 participants. For  
21 the qualitative approach, 21 focus group discussions (FGDs) and 2 in-depth interviews were held  
22 among a total of 223 informants.

23 **Primary outcomes and measures:** Proportion of POSBINDU visitors getting the hypertension  
24 screening and risk factors' assessment, and barriers of POSBINDU implementation.

25 **Results:** Out of the 114,581 POSBINDU visits by 54,224 participants, most (80%) were female and  
26 adults over 50 years old (50%) showing a suboptimal coverage of male and younger adults.  
27 Approximately 95.1% of visitors got their blood pressure measured during their first visit; 353% of  
28 whom had elevated blood pressure. Less than 25% of the visitors reported to be interviewed for NCDs  
29 risk factors during their first visit, less than 80% had anthropometric measurements, and less than 15%  
30 had blood cholesterol examinations. We revealed lack of resources and limited time to perform the  
31 complexities of activities and reporting as main barrier for effective hypertension screening in  
32 Indonesia.

33 **Conclusions:** This study showed missed opportunities in hypertension risk factors screening in  
34 Indonesia. The barriers include a lack of access and implementation barriers (capability, resources,  
35 and protocols).

36 Keywords: Non-communicable diseases, hypertension, screening, community-based program

### 37 **Article Summary**

### 38 **Findings**

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3 40 In a mixed-methods study, we found suboptimal implementation of POSBINDU which reflected the  
4 41 missed opportunities in screening for hypertension and its risk factors in Indonesia. Several barriers  
5 42 include suboptimal coverage, complexities of activities and overlap between different NCD-related  
6 43 programs, and lack of resources.

#### 8 9 44 **Implications**

10 45 There is a need to improve coverage and implementation of POSBINDU for screening for hypertension  
11 46 and its risk factors. An integrated approach to improve the implementation of hypertension screening,  
12 47 from guidelines to practice is crucial.

#### 14 48 **Strengths and Limitations of this study**

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17 49 • This was a relatively large evaluation of POSBINDU in Indonesia, with almost two years of data.  
18 50 • The findings from mixed-methods study provide more comprehensive information on POSBINDU  
19 51 implementation  
20 52 • Information on the contextual factors of POSBINDU implementation can provide insights into  
21 53 steps to improve POSBINDU in the communities .  
22 54 • The use of secondary data poses variations in blood pressure and anthropometrics  
23 55 measurements.  
24 56 • The study limitation also includes the difficulty in differentiating whether the missed reporting  
25 57 was due to lack of activities or lack of reporting. Nevertheless, both the activities and reporting  
26 58 are important in NCDs screening, particularly in the follow up.

#### 29 30 59 **Introduction**

31 60 The increasing trends of Non-Communicable Diseases (NCDs) in the world, including Indonesia,  
32 61 require targeted and specific primary and secondary prevention.[1,2] Hypertension, one of the most  
33 62 common NCDs, has a relatively high (33.4%) prevalence in Indonesia.[3][4] This figure is estimated to  
34 63 increase even further with the changing (more sedentary) lifestyle, unhealthy diet, rising prevalence  
35 64 of obesity, and the increasing life expectancy.[5] In 2015, hypertension attributed to 41% of all  
36 65 disability-adjusted life-years (DALYs) lost, and was the leading risk factor for cardiovascular  
37 66 diseases.[6] Economically, hypertension accounts for \$370 billion in medical costs per year  
38 67 worldwide.[7] Major modifiable risk factors for NCDs include smoking, alcohol consumption,  
39 68 unhealthy diet and obesity, and a sedentary lifestyle.[8,9] With the heavy burden and the economic  
40 69 cost of this disease, primary and secondary prevention for hypertension and its risk factors become  
41 70 very important.

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45 71 In 2010, the WHO has recommended the implementation of Package of Essential Interventions for  
46 72 Non-Communicable (PEN) Diseases for low- and middle-income countries.[10] In response, the  
47 73 Ministry of Health (MOH) in Indonesia launched the Integrated Health Post (POSBINDU), as part of the  
48 74 PEN program. POSBINDU, a community-based program for hypertension screening and  
49 75 prevention[11], was added to the several existing NCD-related programs Indonesia. These include  
50 76 Prolanis (Program Pengendalian Penyakit Kronis), a community-based hypertension and diabetes  
51 77 management program affiliated with primary care[12] and Posyandu Lansia, a community-based NCDs  
52 78 screening and management for the elderly.[13] Despite these efforts, the awareness and control of  
53 79 hypertension are still relatively low: only 25% of people with elevated blood pressure are aware of  
54 80 their condition, and only 54% of people diagnosed with hypertension take routine  
55 81 medication.[4,14,15] These conditions are still below the “rule of halves” for hypertension  
56 82 management, which recommends that 50% of hypertension patients be aware of their condition, with  
57 83 half of whom should be treated.[16,17]

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3 84 A process evaluation is important in assessing the implementation, to identify barriers, and provide  
4 85 specific recommendations for improvement of POSBINDU. Previous studies have evaluated the  
5 86 effectiveness of the POSBINDU implementation.[11,18] However, they were lacking on the evaluation  
6 87 of contextual barriers in POSBINDU implementation. This study aims to portray the implementation  
7 88 of POSBINDU and its contextual barriers, to provide recommendations for better hypertension and its  
8 89 risk factors screening, and optimal linkage to care in Indonesia.

## 11 90 **Methods**

### 12 91 **Setting**

13 92 POSBINDU is a community-based activity run by community health cadres (volunteers) and supervised  
14 93 by primary health care (PHC) officials. POSBINDU aims to empower communities in screening for NCDs  
15 94 and the risk factors, targeting individuals above 15 years old, particularly those of productive  
16 95 age.[19,20] The main activities include screening for NCDs (mainly hypertension and diabetes) and the  
17 96 risk factors (i.e., smoking, diet, physical activity, obesity). Further, POSBINDU also provides health  
18 97 education and facilitate referral to PHC.[19] For this study, we focus on POSBINDU implementation in  
19 98 screening of hypertension and its risk factor, particularly, since only 30% of hypertensive patients in  
20 99 Indonesia received formal diagnosis.[15]

### 24 100 **Study Design**

25 101 This was a concurrent mixed-methods study in seven districts in three provinces in Indonesia (Central  
26 102 Java, East Java, and North Sumatra). We purposely selected provinces with relatively high prevalence  
27 103 of NCDs based on a national health survey conducted in 2018.[21] Cross-sectional study by obtaining  
28 104 POSBINDU reports were conducted for the quantitative evaluation, whereas case study was  
29 105 conducted to explore barriers of POSBINDU implementation.

### 32 106 **Ethnical approval**

33 107 The study was approved by the ethical review board at Universitas Gadjah Mada, reference number  
34 108 KE/FK/0648/2019. The participants of Focus Group Discussion gave informed consent before  
35 109 participating in this study.

### 38 110 **Data Collection**

39 111 Within every one of the three provinces, we selected two districts: one city representing urban  
40 112 communities, and one district representing rural communities. In Central Java, an additional city was  
41 113 also selected (Figure 1). The rural/urban classification is based on population density and facilities  
42 114 available in the communities. For each district, approximately 50% of the primary health care (PHC)  
43 115 were selected as areas for data collection (n PHC=100). Within the PHC, we collected data for  
44 116 quantitative process evaluation from all active POSBINDU in the areas (n POSBINDU=475). Due to the  
45 117 different number of POSBINDU within each district or PHCs, the number of POSBINDU visitors as well  
46 118 as visits varies by the areas. In most POSBINDU, online/electronic data were not available; Hence, data  
47 119 on participation were manually collected from the POSBINDU register. Data from 2018-2019 were  
48 120 collected, except for Central Java, in which data were available through September 2019.

51 121 For the qualitative approach, 21 focus group discussions (FGDs) and 2 in-depth interviews were held  
52 122 among a total of 223 informants: 22 from Districts Health Department, 101 from Primary Health Care  
53 123 (PHC) facilities and 100 POSBINDU cadres. The two in-depth interviews were conducted with health  
54 124 districts department officials. Within each district, we conducted purposive sampling to recruit health  
55 125 officials responsible for POSBINDU program from the district's health department, and primary health  
56 126 care. We also recruit 2-3 cadres from each PHC based on list of cadres obtained from PHC officials.  
57 127 These participants were recruited to obtain information on POSBINDU implementation facilitators and  
58 128 barriers. The size of the FGDs was on average 10 persons (min 4, max 18). Verbatim transcripts of the

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3 129 FGD's were made for qualitative analyses. The FGD facilitators had public health background and  
4 130 experience in conducting qualitative research. All facilitators attended the preparatory meeting to  
5 131 discuss the FGDs and interview guidelines, to obtain similar perception regarding the aims of FGDs  
6 132 and interviews and items of the FGD guidelines.

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9 133 Insert Figure 1 here

#### 10 134 Outcome and variables measurements

11 135 Missed opportunities in hypertension screening were quantified by the proportion of POSBINDU  
12 136 visitors getting the risk factors anamnesis, and measurement of anthropometric tests, blood pressure  
13 137 and cholesterol. Analyses was conducted on each indicator to provide more detailed information on  
14 138 specific components of screening which were lacking. Sociodemographic variables which were  
15 139 available on the POSBINDU register, were included in the analyses: sex, age, and level of education.  
16 140 Age was classified into several groups based the Indonesian Ministry of Health classification for age  
17 141 (youth = 15-24 years old, adult = 25-44 years old, pre-elderly = 45-59 years old, and elderly => 60 years  
18 142 old). Occupation was not included in the analyses due to high missing value in the POSBINDU reports  
19 143 (>60%).

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23 144 Personal and family history of NCDs were also obtained, which include seven (7) diseases:  
24 145 hypertension, diabetes, heart disease, stroke, asthma, cancer, and high blood cholesterol. Complete  
25 146 personal/family history variables were coded 1 if all information was available and coded 0 if at least  
26 147 one of the disease histories was missing. Any personal/family history variables were coded 1 if at least  
27 148 one of the disease histories was available and coded 0 if all of the history information was missing.

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30 149 We also generate variable "incomplete information" which represent whether the individual received  
31 150 the recommended procedure (history taking, anthropometric measurement, blood pressure  
32 151 measurement, and blood examination). The proportion presented in the analyses, described the  
33 152 individuals who did not receive the complete recommended procedure.

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36 153 We used the logic model framework for process evaluation to assess the implementation of  
37 154 POSBINDU. We adopted several indicators from the current literature on the use of logic model in  
38 155 process evaluation of community-based health intervention [22–24]. The FGDs theme as well as  
39 156 indicators of the secondary data developed based on the literature, were discussed with officials from  
40 157 health department and PHC officials in one pilot site for finalization. We further explored the barriers  
41 158 of POSBINDU implementation using a qualitative approach.

#### 42 159 Analyses

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44 160 Statistical analyses were conducted using STATA, to calculate the proportion of activities and  
45 161 outcomes. We further conduct Chi-square, T-test, and ANOVA to assess the statistical significance of  
46 162 the differences. Analyses were conducted on missing information, reflecting whether specific  
47 163 procedure in POSBINDU were carried out and reported. Further analyses on proportion of  
48 164 hypertension and BMI status were also conducted. The two indicators were reported due to relatively  
49 165 high availability of these data (92% and 76%) compared to other indicators. Verbatim transcript from  
50 166 FGDs and in-depth interviews recordings were analyzed. Content analysis was applied for the  
51 167 qualitative data to ascertain barriers for the POSBINDU implementation in Indonesia by two  
52 168 independent researchers. To enhance trustworthiness, we assess barriers of POSBINDU from several  
53 169 sources for triangulation purposes: health and PHC officials to reflect implementer's perspective, and  
54 170 cadres to reflect implementers and users' perspective. During data analyses, we also discuss the  
55 171 findings with representative of the FGD participants, i.e., member checking. Parallel analyses were  
56 172 conducted to synthesize the findings from the quantitative and qualitative approaches. Weaving



173 technique, analyzing the quantitative and qualitative findings together by theme or concept, was used  
174 to integrate the findings.[25]

### 175 Patients and public involvement

176 Patients or the public were not directly involved in the design, or conduct, or reporting, or  
177 dissemination plans of our research.

## 178 Results

### 179 Participation of community for hypertension screening in POSBINDU

180 Data from 114,581 POSBINDU visits (54,224 participants) were analyzed. The findings showed similar  
181 patterns in the districts and provinces: more female and elderly participants. Approximately 80% were  
182 female participants, with the highest proportion of female participants in rural North Sumatra (95.5%).  
183 Meanwhile, in Java, a higher proportion of female participants were observed in urban areas (Table  
184 1).

185 Table 1. Characteristics of POSBINDU Participants within the Three Provinces in Indonesia  
186 (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total
	Rural	Urban	Rural	Urban	Rural	Urban	
Number of individuals	5,103	10,999	23,053	4,983	3,398	6,688	54,224
Number of PHC	11	23	29	9	11	17	100
Number of POSBINDU	38	38	283	27	27	62	475
<b>Categorical (% SE)</b>							
Female	95.5 (0.3)	71.3 (0.4)	76.2 (0.3)	86.7 (0.5)	73.7 (0.8)	88.2 (0.4)	79.4 (0.2)
Age							
15-24	8.7 (0.4)	6.1 (0.3)	6.2 (0.2)	7.8 (0.4)	13.3 (0.7)	3.8 (0.3)	6.7 (0.1)
25-44	38.1 (0.8)	24.9 (0.5)	33.0 (0.3)	48.7 (0.8)	47.7 (1.0)	28.9 (0.7)	22.2 (0.2)
45-59	30.7 (0.7)	37.6 (0.6)	33.2 (0.3)	31.0 (0.6)	30.1 (0.9)	42.4 (0.7)	24.8 (0.2)
>60	22.4 (0.6)	31.3 (0.6)	27.6 (0.3)	12.5 (0.5)	8.9 (0.6)	24.9 (0.6)	24.7 (0.2)
Education**							
PS	2.6 (0.2)	15.3 (0.3)	57.3 (0.3)	50.5 (0.7)	41.1 (0.8)	25.2 (0.5)	38.0 (0.2)
HS	0.3 (0.07)	0.7 (0.1)	0.3 (0.0)	1.3 (0.2)	2.3 (0.3)	1.8 (0.2)	0.8 (0.0)
Univ	0.0 (0.0)	2.7 (0.2)	0.4 (0.04)	4.9 (0.3)	4.9 (0.4)	2.1 (0.2)	1.8 (0.1)
Missing	97.1 (0.2)	81.4 (0.4)	41.9 (0.3)	43.3 (0.7)	51.8 (0.9)	70.8 (0.6)	59.4 (0.2)
Number of visits							
1 time	87.0 (0.4)	77.4 (0.3)	68.4 (0.3)	65.6 (0.7)	84.5 (0.6)	56.4 (0.6)	71.2 (0.1)
2-6 times	12.9 (0.5)	21.7 (0.3)	21.1 (0.2)	23.9 (0.6)	13.3 (0.6)	35.1 (0.6)	22.0 (0.1)
7-12 times	0.1 (0.0)	0.6 (0.1)	6.3 (0.2)	6.0 (0.3)	2.1 (0.2)	5.9 (0.3)	5.3 (0.1)
>12 times	0 (0.0)	0.2 (0.1)	4.1 (0.1)	4.5 (0.3)	0.1 (0.0)	2.6 (0.2)	1.4 (0.1)
<b>Continuous (mean, SE)</b>							
Age	46.4 (0.2)	51.7 (0.2)	49.7 (0.1)	43.4 (0.2)	41.0 (0.3)	50.4 (0.2)	48.6 (0.8)
Number of visits	1.2 (0.8)	1.4 (0.1)	2.5 (0.2)	2.7 (0.5)	1.4 (0.2)	2.5 (0.3)	2.1 (0.1)

187 Notes:

188 Within province, rural-urban comparisons are significant at 0.05

189 Between provinces comparisons are significant at 0.05  
 190 Differences in proportion tested using Chi squares  
 191 SE= standard error  
 192 \*\*Education = HS (High school) PS (Primary school/less) Univ (University/college), Missing = data  
 193 missing

195 Despite the relatively high missing information on age (n missing= 12,084, or 22.3%), we found that  
 196 the participants were on average of older age, with roughly 50% of participants aged over 50 years  
 197 old (Table 1). The highest proportion of participants >60 years old were observed in rural East Java  
 198 (31.3%), with mean age of 51.7 years old. We measured the youngest POSBINDU participants in rural  
 199 Central Java (mean age 41.0 years old). Meanwhile, the missing information on education level were  
 200 higher (almost 60%), with even higher proportion in North Sumatra.

201 In the span of the two years of secondary data collection, we found that, on average, the participants  
 202 visit POSBINDU twice, with the lowest average of visits in North Sumatra (rounded to 1  
 203 visit/participant). Approximately 38,628 (71.2%) of participants visit POSBINDU once for two years,  
 204 and 761 (1.4%) visits POSBINDU more than 12 times.

205 Table 2. Missed Opportunity in Hypertension Screening and Risk Factors Characteristics within  
 206 POSBINDU Participants (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total %(SE)
	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	
<b>Missing Information in All Visits</b>							
n	6,061	15,774	57,504	13,422	4,925	16,895	114,581
Personal history (complete)	99.3 (0.1)	92.6 (0.2)	67.9 (0.2)	42.5 (0.4)	62.1 (0.7)	95.2 (0.2)	73.8 (0.1)
Family history (complete)	99.4 (0.1)	92.6 (0.2)	65.1 (0.2)	39.7 (0.4)	61.6 (0.7)	95.9 (0.2)	72.1 (0.1)
Personal history (any)	88.2 (0.4)	88.5 (0.3)	56.4 (0.2)	17.2 (0.3)	54.2 (0.7)	91.0 (0.2)	62.9 (0.1)
Family history (any)	97.5 (0.2)	88.9 (0.3)	57.3 (0.2)	28.9 (0.4)	53.5 (0.7)	93.8 (0.2)	65.7 (0.1)
Height	42.7 (0.6)	19.0 (0.2)	15.6 (0.2)	20.7 (0.3)	30.6 (0.7)	23.3 (0.3)	19.9 (0.1)
Weight measurement	35.8 (0.6)	16.0 (0.2)	18.8 (0.2)	5.6 (0.2)	8.9 (0.4)	12.3 (0.3)	16.4 (0.1)
Waist circumference	49.5 (0.6)	36.0 (0.3)	15.6 (0.2)	12.7 (0.2)	36.9 (0.6)	63.6 (0.4)	27.8 (0.1)
Blood pressure	1.8 (0.2)	5.8 (0.2)	9.8 (0.1)	4.6 (0.2)	4.2 (0.3)	6.3 (0.2)	7.4 (0.1)
Blood cholesterol	87.0 (0.4)	80.1 (0.3)	81.9 (0.2)	97.4 (0.1)	91.1 (0.4)	82.0 (0.3)	84.2 (0.1)
Incomplete information	99.6 (0.1)	95.1 (0.2)	98.1 (0.1)	99.6 (0.1)	99.6 (0.1)	99.6 (0.1)	98.2 (0.1)
<b>Missing Information in First Visits</b>							
n	5,103	10,999	23,053	4,983	2,298	6,688	54,224
Personal history (complete)	99.2 (0.1)	89.9 (0.3)	72.8 (0.3)	35.1 (0.7)	49.3 (0.9)	92.6 (0.3)	76.3 (0.2)
Family history (complete)	99.3 (0.1)	89.8 (0.3)	71.3 (0.3)	41.4 (0.7)	50.9 (0.9)	93.5 (0.3)	76.4 (0.2)
Personal history (any)	88.2 (0.5)	85.1 (0.3)	58.3 (0.3)	15.3 (0.5)	40.1 (0.8)	86.9 (0.4)	68.3 (0.2)
Family history (any)	97.3 (0.2)	85.2 (0.3)	60.6 (0.3)	30.0 (0.6)	40.1 (0.8)	90.5 (0.4)	65.0 (0.2)
Height	41.8 (0.7)	19.0 (0.4)	14.8 (0.2)	21.1 (0.6)	20.4 (0.7)	23.0 (0.5)	20.1 (0.2)

Weight	35.3 (0.3)	15.0 (0.3)	16.7 (0.2)	47.6 (0.3)	7.2 (0.4)	12.9 (0.4)	15.9 (0.1)
Waist circumference	48.9 (0.7)	33.6 (0.4)	11.1 (0.2)	12.9 (0.5)	23.0 (0.7)	66.1 (0.6)	26.9 (0.2)
Blood pressure	1.7 (0.2)	5.4 (0.2)	4.9 (0.1)	5.0 (0.3)	3.2 (0.3)	7.0 (0.3)	4.9 (0.1)
Blood cholesterol	86.1 (0.5)	75.7 (0.4)	76.6 (0.3)	97.9 (0.2)	92.3 (0.4)	79.1 (0.5)	80.6 (0.2)
Incomplete information	99.6 (0.1)	93.0 (0.2)	96.7 (0.1)	99.7 (0.1)	99.4 (0.1)	99.4 (0.1)	97.01 (0.1)
<b>Risk Factors Screening in All Visits</b>							
n	3,423	12,015	45,108	10,484	3,374	12,750	87,154
<b>BMI</b>							
Normal	48.3 (0.9)	48.2 (0.5)	51.3 (0.2)	44.6 (0.5)	52.3 (0.9)	46.4 (0.4)	49.3 (0.2)
Underweight	4.9 (0.4)	4.5 (0.2)	8.0 (0.1)	4.5 (0.2)	9.1 (0.5)	3.8 (0.2)	6.3 (0.1)
Overweight	31.9 (0.8)	34.4 (0.4)	30.8 (0.2)	34.7 (0.4)	29.1 (0.8)	34.2 (0.4)	32.3 (0.2)
Obese	14.9 (0.6)	12.9 (0.3)	10.0 (0.3)	16.3 (0.4)	9.4 (0.5)	15.7 (0.3)	12.1 (0.1)
n	5,942	14,835	51,784	12,773	4,717	15,814	105,865
Hypertension	35.4 (0.6)	28.0 (0.4)	42.5 (0.2)	33.7 (0.4)	25.6 (0.6)	35.9 (0.4)	37.2 (0.1)
<b>Risk Factors Screening in First Visits</b>							
n	2,925	8,440	18,820	3,850	2,678	5,078	41,791
<b>BMI</b>							
Normal	49.3 (0.9)	48.0 (0.5)	51.5 (0.4)	45.3 (0.8)	52.4 (1.0)	44.4 (0.7)	49.3 (0.2)
Underweight	4.8 (0.4)	4.5 (0.2)	7.7 (0.2)	5.1 (0.4)	10.1 (0.6)	4.2 (0.3)	6.3 (0.1)
Overweight	32.0 (0.9)	34.2 (0.5)	30.4 (0.3)	33.3 (0.8)	28.7 (0.9)	35.1 (0.7)	32.0 (0.2)
Obese	13.9 (0.6)	13.3 (0.4)	10.4 (0.2)	16.3 (0.6)	8.8 (0.5)	16.3 (0.5)	12.4 (0.2)
n	5,008	10,379	21,858	4,725	3,288	6,201	51,459
Hypertension	34.5 (0.7)	28.5 (0.4)	40.5 (0.3)	31.6 (0.7)	25.1 (0.8)	37.9 (0.6)	35.3 (0.2)

## 207 Notes:

208 Within province, rural-urban comparisons are significant at 0.05

209 Between provinces comparisons are significant at 0.05

210 Differences in proportion tested using Chi squares

211 SE= standard error

212

213 We further observed the relatively high missing information for hypertension screening across the  
 214 districts, with the following general pattern. First, a relatively high proportion of missing information  
 215 concerning the personal and family history, with East Java having the lowest proportion. Second, a  
 216 relatively lower proportion of missing data on anthropometric measurements (less than 50%). Third,  
 217 we found the highest proportion of available data for blood pressure measurements in all the seven  
 218 districts. Last, our analysis identified higher missing values for blood cholesterol measurements  
 219 (84,2%). For all measurements, there were significant differences between the three provinces, as  
 220 well as between the rural and urban areas within the provinces (Table 2).

221 Based on available data, we found that obesity seems to be more prevalent in urban areas in Java, but  
 222 relatively similar in North Sumatra. In contrast, hypertension was more prevalent in a rural area for  
 223 East Java and North Sumatra but was more common in urban districts of Central Java (Table 2).  
 224 However, these data should be interpreted cautiously due to the relatively high missing data on the  
 225 measurements.

226 **Barriers for the screening of hypertension in POSBINDU**

227 The qualitative data supported the quantitative finding about lacking participation of male and  
 228 younger population to POSBINDU. In the FGDs, cadres and health officials stated the barriers for male  
 229 and younger participants to attend POSBINDU, including the inconvenience of POSBINDU schedule, as  
 230 well as low awareness for hypertension screening (Table 3).

231 Table 3. Qualitative analyses of Focus Group Discussion amongst POSBINDU Cadres, Primary Health  
 232 Care and Health Department Officials

Themes	Category	Codes
Suboptimal target population and gap in policy	Participants' characteristics	Younger adults rarely participate
		Lack of male participants
	Barrier to participations	Schedule incompatibility
		Low awareness for screening
		Lack of role model for screening
	Ineffective policy and coordination	Lack of prioritization for NCD
		Implementation gap of national policy/program at the local level
		The need for coordination with different stakeholders
		The need for coordination among NCD-related programs
	Lack of human resources in terms of capability and quantity for hypertension screening	Cadres have multiple tasks, with time constraints
Cadres are volunteers with other obligations		
Cadres' competencies		Lack of knowledge on hypertension and other NCD
		Lack of ability to conduct measurements and provide health education
		Lack of ability to conduct recording and reporting
Lack of NCD program officers for supervision and reporting		Lack of NCD program officers at PHC
		Most program officers are responsible for multiple tasks/programs
		Lack of reporting officers
Provision of Referral Counselling		The participant with hypertension is not always referred to PHC
		Lack of counseling to participants before the referral made
		POSBINDU has referral form, but rarely used
		Treatment for the referral is covered by their health insurance
Lack of resources for hypertension screening and prevention		Equipment for hypertension screening
	Equipment maintenance is inadequate	
	Limited logistics for cholesterol measurement	
	Lack of budget	POSBINDU is funded by the government, stakeholder (private sectors) or community
		Lack of budget for POSBINDU activities

		Lack of budget for cadres training and incentives
	Health education material	Lack of health education materials
	Infrastructure for recording and reporting	Not all cadres have laptops
		Limited internet connection in some areas
		Most POSBINDU stations use manual reporting
Time constraints for implementation based on MOH standard	The complexity of activities and time limitation	The time required for examination is too long
		Too many information needs to be asked and filled out
		The referral form is rarely used
	The complexity of reporting forms	Many forms need to be filled, while time is limited
		A simplified form in checklist format is preferred

233

234 The need for role model from community leader to improve participation and the barrier for  
235 participation, particularly among males is highlighted by these quotes:

236 *“ Yes, we don’t have a lot of men (participants), because they are working “ (Cadre, FGD#21)*

237 *“ In our POSBINDU, the awareness for early screening is still low. Only several people come (to  
238 POSBINDU), younger people don’t want to come because (POSBINDU is conducted) during  
239 working days “ (Cadre, FGD#3)*

240 *“ ...Socialization for this (POSBINDU) is needed, often, the community leader in our area don’t  
241 want to participate because they are afraid to be screened” (Cadre, FGD#2)*

242 *“.. when I asked the communities, why they did not come to POSBINDU, or why there were only  
243 few people, they said because I (the community member) were not sick, so why do I need to get  
244 (health) check-up (?). So, they were not aware that POSBINDU is not only for those who are sick”  
245 (Health official, FGD#19)*

246 *“ I asked POSBINDU (participant), why elderly? Where are the younger population? And they  
247 said that the young stayed at home because they were embarrassed if they have diseases.. “  
248 (Health official, FGD#16)*

249 Lack of priority and overlap of NCD-related programs also contribute to a suboptimal target population  
250 of POSBINDU, as illustrated by the following quote:

251 *“ (NCD) is not a priority program, hence, there’s a lack of commitment between the superior  
252 (health department) with the program officials, for example.” (Health official, FGD#7)*

253 *“...(different department in) the Ministry of Health focus on specific diseases, such as diabetes  
254 and cancer... However, in the community, (the programs) become general. (We) run Polindes,  
255 (Posyandu) Lansia, POSBINDU, School Health Program. In my opinion, the regulation is rigid  
256 and detailed, but the implementation is mixed (overlap). If we want to give optimum results,  
257 it takes efforts.” (Health official, FGD#10).*

258 Several barriers for implementation were revealed. The cadres and health officers often have to run  
259 several different programs. The FGDs also revealed a lack of capability of cadres to conduct  
260 measurements for hypertension screening, providing health education, and also conducting the  
261 recording and reporting of the POSBINDU activities and measurements. The informants also

262 mentioned a lack of resources, including budget, equipment, and logistics to conduct all the  
263 measurements.

264 *“ One person can hold 5 positions in PHC activities... POSBINDU cadres, Posyandu Lansia cadres,*  
265 *and other programs.. “ (Cadre, FGD#11)*

266 *“ (cadres of) Posbindu do not have laptop nor cell phone for the reporting application (of*  
267 *POSBINDU), hence, we report to PHC manually” (Cadre, FGD#14)*

268 The barriers also include the complexities of the activities and measurements, as well as extensive  
269 reporting forms, which require a long time to be completed.

270 *“ ...it takes a long time, because of the measurements and stages (of POSBINDU activities) “ (PHC*  
271 *officer, FGD#8)*

272 *“ ...POSBINDU report is too time-consuming, because it is long (detail), including identity, cell*  
273 *phone number, address, and others... and it has to be filled out every month.” (PHC officer,*  
274 *FGD#6)*

275 Interestingly, in several districts, we found the implementation of mobile POSBINDU, moving from  
276 one community to the other within the same subdistricts.

277 *“Our POSBINDU is mobile, we have ten communities, so every week, we move from one*  
278 *community to the next, focusing on people 15-59 years old.” (Cadre, FGD#18)*

279 We further synthesized the quantitative and qualitative results. We categorized the barriers into three  
280 main parts: 1) input, reflecting the target population/coverage of POSBINDU, 2) process, describing  
281 the implementation of POSBINDU activities, and 3) output, reflecting the recording and reporting  
282 process of POSBINDU (Figure 2). Results show that in both approaches we found lacking participation  
283 of male and younger people in POSBINDU. Lack of priority for NCD screening and ineffective  
284 coordination among stakeholders, combined with lack of awareness and access might attribute to this  
285 finding. The high missed opportunity, particularly in history taking and measurements, were likely due  
286 to the complexity of the activities/measurements, as well as lack of resources. The high missing data  
287 also stem from the complexity of the forms and lack of capability for online reporting.

288 Insert Figure 2 here

## 289 Discussion

290 In this study, we revealed missed opportunities in input, activities, and output of POSBINDU  
291 implementation in screening for hypertension and its risk factors. Several contextual barriers were  
292 identified. The suboptimal coverage was possibly due to lack of priority for NCD screening, lack of  
293 awareness and access, and overlap of NCD-related program. The suboptimal activities and reporting  
294 were likely caused by a lack of resources, as well as limited time to perform the complexities of  
295 activities and reporting according to MOH guideline.

296 The missed opportunity to screen male and younger population that we found in this study is  
297 particularly concerning. Although the prevalence is lower than of the older population, hypertension  
298 prevalence among young Indonesian is still relatively high (28%).[26] While the target population of  
299 POSBINDU is listed as those 15 years or older, the elderly are usually targeted in Posyandu Lansia, a  
300 community-based screening and management for the elderly population.[27] Awareness is also lower  
301 in male and younger adults, signaling the need to screen this population.[3] Ideally, POSBINDU  
302 becomes the “gatekeeper” for screening in the community. Hypertensive and diabetic patients were

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3 303 then referred to PHC and joined Prolanis, a community-based activity funded by the health insurance  
4 304 program, for management of chronic diseases patients.[12]

6 305 Furthermore, with a lack of male participation, POSBINDU is missing one of the key target populations  
7 306 for risk factors screening: smokers. Analysis of a national survey in 2014 reported 32% prevalence of  
8 307 smoking, with approximately 40% of males aged 15-55 years old and 14% of male adolescents are  
9 308 current smokers.[28–30] Further, 20% of Indonesia's total chronic diseases are attributed to smoking,  
11 309 with hypertension as the highest proportion.[31] Screening for hypertension and its risk factors  
12 310 earlier, combined with lifestyle-based interventions effectively avoid future complications.[32,33]

14 311 We also revealed the need to prioritize and reorganize the current NCD-related programs, to address  
15 312 the suboptimal coverage and the overlap. An example of the gap between the national  
16 313 recommendation and local implementation is reflected in the coordination of existing NCD-related  
17 314 programs: POSBINDU, Posyandu Lansia, and PANDU PTM. In the MOH, the PANDU PTM (Pelayanan  
19 315 Terpadu Penyakit Tidak Menular, Integrated Health Services for NCDs) and POSBINDU are regulated  
20 316 under the Directorate for Disease Management, while Posyandu Lansia is under the Directorate of  
21 317 Public Health. Despite the different directorates, the implementation at community level is often  
22 318 conducted simultaneously and often overlap. Reporting, however, is conducted separately. Hence, as  
23 319 previous studies have noted, we also recommend the need of comprehensive and coordinated NCDs  
24 320 prevention program in Indonesia.[34–36]

27 321 The relatively high missed opportunity in screening for hypertension risk factors, as well as  
28 322 sociodemographic characteristics found in this study, portrays suboptimal implementation of  
29 323 POSBINDU. This can be caused by a lack of recording and reporting (monitoring and evaluation fidelity)  
30 324 or lack of measurement (implementation fidelity). In our further elaboration during the FGDs, we  
31 325 found that lack of human resources might contribute to the suboptimal implementation of POSBINDU.  
32 326 Our findings revealed the need to train cadres to improve their skills and efficiency in conducting the  
33 327 measurements and history taking, as well as reporting the measurements. This is in line with findings  
34 328 from Meinema et al (2017 and Abdell-All et al (2018)[37,38]. Our findings also imply the complexities  
35 329 of the activities and reporting of POSBINDU which lead to ineffective implementation. It is important  
36 330 to ensure that valuable screening information can be recorded and followed up, for better  
37 331 intervention. A simplified screening program with integrated reporting is needed.

41 332 In this study, we also discovered lack of financial resources and equipment as barriers to POSBINDU  
42 333 implementation. The integration of POSBINDU and PANDU PTM to the national health insurance  
43 334 scheme might be important to ensure the sustainability of funding for the program. Integration of  
44 335 POSBINDU into the national health insurance can also improve participation of the working  
45 336 population, most of whom are covered by the national health insurance.[39] Previous studies have  
46 337 reported an increase in uptake of service by health insurance membership.[40–42]

48 338 Based on our findings, we identified two main areas that needs to be improved: coverage and  
49 339 implementation of POSBINDU. To improve coverage of POSBINDU, there are two important steps that  
50 340 we recommend. First, an integrated approach with collaboration amongst different programs and  
51 341 directorates to reduce the overlap and simplify the POSBINDU implementation at the PHC and  
52 342 community level. PANDU PTM as the adaptation of WHO PEN,[43] needs to be implemented in a  
53 343 wider scale. Second, redirecting the target population of hypertension screening, to cover also  
54 344 younger and male population. A workplace-based screening program which can address the barriers  
55 345 identified in the qualitative findings is recommended.[44,45] For this younger population, the use of  
56 346 mobile technology for monitoring of risk factors and measurement might be effective. Previous

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3 347 studies have reported the effectiveness of mobile health for hypertension screening and risk  
4 348 stratification.[46,47]  
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6 349 To improve the implementation and components of POSBINDU activities, a simplified algorithm to  
7 350 screen and refer the target population is needed. The algorithm needs to be developed both in the  
8 351 electronic format and manual format to address the different capabilities of community cadres and  
9 352 resources in the community. Simplifying the program and reporting systems will also reduce the  
10 353 workload of PHC and district health officials. Further, a clear algorithm for the referral of “screened”  
11 354 cases to PHC is important. The readiness of the PHCs also needs to be improved to adequately manage  
12 355 the potential surge in referred cases. Lastly, there is a need to integrate hypertension and CVD  
13 356 screening program into the national health insurance system. Hence, ensuring the sustainability of  
14 357 funding and resources of the program. With these approaches, comprehensive screening for  
15 358 hypertension and CVD along the continuum of care might be more effective.  
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19 359 This study has several limitations. First, the proportion of our measures are not reflective for the whole  
20 360 target population of POSBINDU, since the participants were mostly female and of older age. The  
21 361 characteristics of our sample, which are generally older with a higher proportion of females, drive the  
22 362 proportion higher than that of the general population in Indonesia. However, this study reflects the  
23 363 current participants of POSBINDU. Second, we used a secondary data collection by POSBINDU cadres,  
24 364 the high number of missing data that we presented in this study, probably stem from two main  
25 365 sources: omissions in reporting or a true lack in measurement/activities. Nevertheless, both the  
26 366 activities and reporting are important in NCDs screening, particularly in the follow-up. The secondary  
27 367 data also prone to measurement bias, particularly, with the variations in POSBINDU measurements by  
28 368 cadres. The Ministry of Health provided guidelines in the measurement for hypertension in POSBINDU,  
29 369 however, the implementation might vary. The high missing information on several sociodemographic  
30 370 characteristics i.e., occupation and education, also limit our ability to conduct multivariable analyses.  
31 371 Another limitation of this study is we have not included the perspective of POSBINDU participants in  
32 372 the FGDs. Instead, we considered the POSBINDU cadres to represents the voice of both the  
33 373 implementers as well as users. However, we include the perspective of the POSBINDU participants in  
34 374 the baseline of our prospective data collection (ongoing).  
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39 375 Despite the limitation, there are several strengths of the study: First, to our knowledge, this was the  
40 376 first relatively large evaluation of POSBINDU. Second, the use of a mixed-methods study design, and  
41 377 therefore, providing more comprehensive information on POSBINDU implementation. Third, the  
42 378 study also investigates the contextual factors that should be addressed in the improvement of the  
43 379 community-based hypertension screening program in Indonesia. This study might provide insights into  
44 380 POSBINDU implementation in other areas in Indonesia, and can be the basis for further  
45 381 recommendation to improve POSBINDU implementation.  
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## 48 382 **Conclusion**

49 383 This study showed the suboptimal implementation of POSBINDU activities. Particularly, the missed  
50 384 opportunity in screening for hypertension risk factors in Indonesia. The barriers include a lack priority  
51 385 for NCDs, lack of awareness and access for subpopulation, and several implementation barriers:  
52 386 capability, resources, and protocols. An innovative approach to simplify and improve the capacity of  
53 387 POSBINDU is in preparation to optimize the screening and linkage to hypertension care in Indonesia.  
54 388 This study provides evidence-based recommendations in improving the current implementation of  
55 389 POSBINDU, in the Indonesian context.  
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### 390 **Data Statement**

391 The de-identified data from this study is available upon request to the corresponding or first author  
392 pending thorough review of request and adherence to the Indonesian government regulation on  
393 data sharing.

### 394 **Author Contributions**

395 VW, AP, RFP, EP, YM, JK and JLD contributed in the design of the study. VW, A, RFP, EP, YM, B, and M  
396 participate actively in study implementation, including in data collection. VW, YM, S, and RFP analyzed  
397 the quantitative data. AP, EP, and B analyzed the qualitative data. VW, AP, RFP, S, and YM draft the  
398 manuscript with all co-authors revised critically. All authors read and approved the final manuscript.

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### 403 **Conflict of Interest**

404 None declared

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### 411 **Acknowledgment**

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413 Figure 1. Study Sample Selection

414 Figure 2. Synthesis of the Quantitative and Qualitative Findings

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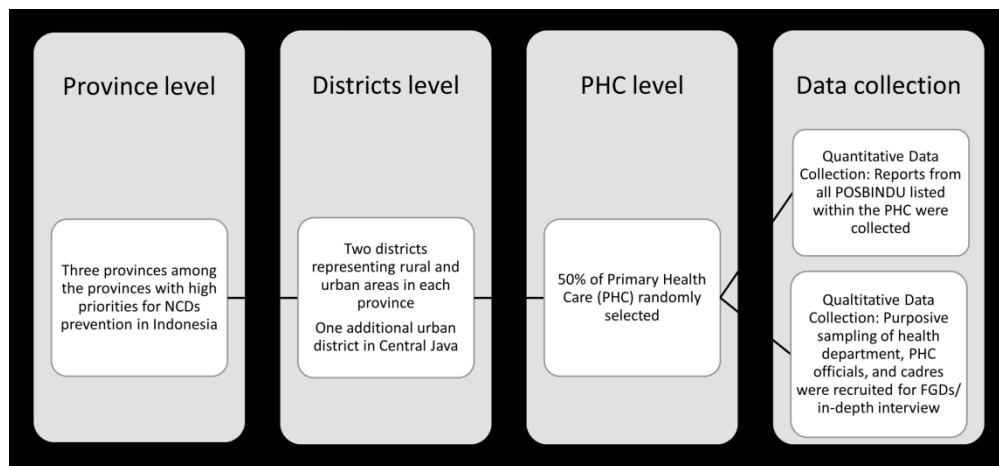


Figure 1. Study Sample Selection

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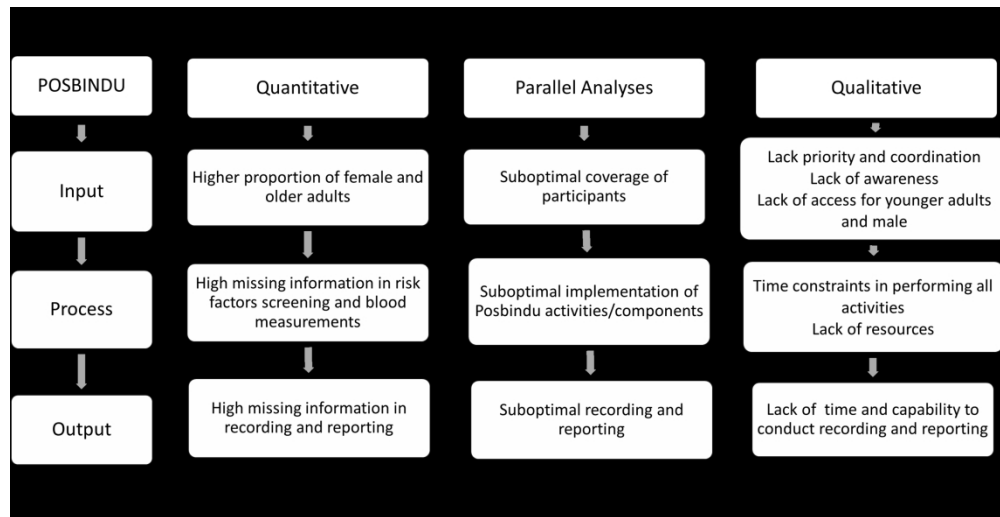


Figure 2. Synthesis of the Quantitative and Qualitative Findings

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Page 1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 2
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 2-3
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Page 3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 3
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	Page 3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 4
Bias	9	Describe any efforts to address potential sources of bias	N/A, descriptive analyses
Study size	10	Explain how the study size was arrived at	Page 3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 4
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Page 4
		(b) Describe any methods used to examine subgroups and interactions	Page 4
		(c) Explain how missing data were addressed	Page 4
		(d) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	N/A
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 4
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	Page 4 (referred)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 5
		(b) Indicate number of participants with missing data for each variable of interest	Page 6

Outcome data	15*	Report numbers of outcome events or summary measures	Page 6
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	N/A, descriptive analyses
		(b) Report category boundaries when continuous variables were categorized	Page 5-6
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	Page 10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page 11
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 12

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).



# Standards for Reporting Qualitative Research (SRQR)\*

<http://www.equator-network.org/reporting-guidelines/srqr/>

Page/line no(s).

## Title and abstract

<p><b>Title</b> - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended</p>	<p>Page 1/Line 1</p>
<p><b>Abstract</b> - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions</p>	<p>Page 1/Line 14-36</p>

## Introduction

<p><b>Problem formulation</b> - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement</p>	<p>Page 2/Line 53-77</p>
<p><b>Purpose or research question</b> - Purpose of the study and specific objectives or questions</p>	<p>Page 2/Line 80-82</p>

## Methods

<p><b>Qualitative approach and research paradigm</b> - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**</p>	<p>Page 2/Line 98</p>
<p><b>Researcher characteristics and reflexivity</b> - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability</p>	<p>Page 3/ Line 116-119</p>
<p><b>Context</b> - Setting/site and salient contextual factors; rationale**</p>	<p>Page 3/ Line 85-93</p>
<p><b>Sampling strategy</b> - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**</p>	<p>Page 3/ Line 114-121</p>
<p><b>Ethical issues pertaining to human subjects</b> - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues</p>	<p>Page 3/Line 100-102</p>
<p><b>Data collection methods</b> - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**</p>	<p>Page 3/ Line 114-125</p>

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2	<b>Data collection instruments and technologies</b> - Description of instruments (e.g.,	
3	interview guides, questionnaires) and devices (e.g., audio recorders) used for data	Page 3/Line
4	collection; if/how the instrument(s) changed over the course of the study	148-150
5		
6	<b>Units of study</b> - Number and relevant characteristics of participants, documents,	Page 3/ Line
7	or events included in the study; level of participation (could be reported in results)	114-116
8		
9	<b>Data processing</b> - Methods for processing data prior to and during analysis,	
10	including transcription, data entry, data management and security, verification of	Page 3/ Line
11	data integrity, data coding, and anonymization/de-identification of excerpts	156-167
12		
13	<b>Data analysis</b> - Process by which inferences, themes, etc., were identified and	
14	developed, including the researchers involved in data analysis; usually references a	Page 3/ Line
15	specific paradigm or approach; rationale**	158-160
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17	Techniques to enhance trustworthiness - Techniques to enhance trustworthiness	
18	and credibility of data analysis (e.g., member checking, audit trail, triangulation);	Page 3/ Line
19	rationale**	160/163
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## Results/findings

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23	<b>Synthesis and interpretation</b> - Main findings (e.g., interpretations, inferences, and	
24	themes); might include development of a theory or model, or integration with	Page 7/ Line
25	prior research or theory	209-215
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27	<b>Links to empirical data</b> - Evidence (e.g., quotes, field notes, text excerpts,	Page 8/Line
28	photographs) to substantiate analytic findings	218-261
29		

## Discussion

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32	<b>Integration with prior work, implications, transferability, and contribution(s) to</b>	
33	<b>the field</b> - Short summary of main findings; explanation of how findings and	
34	conclusions connect to, support, elaborate on, or challenge conclusions of earlier	Page 10/Line
35	scholarship; discussion of scope of application/generalizability; identification of	279-319
36	unique contribution(s) to scholarship in a discipline or field	
37		Page 11/Line
38	<b>Limitations</b> - Trustworthiness and limitations of findings	353-356
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## Other

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43	<b>Conflicts of interest</b> - Potential sources of influence or perceived influence on	Page 12/Line
44	study conduct and conclusions; how these were managed	386
45		
46	<b>Funding</b> - Sources of funding and other support; role of funders in data collection,	Page 12/Line
47	interpretation, and reporting	381-383
48		

\*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

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\*\*The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

**Reference:**

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014  
DOI: 10.1097/ACM.0000000000000388

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# BMJ Open

## Missed Opportunities in Hypertension Risk Factors Screening in Indonesia: A Mixed-methods Evaluation of Integrated Health Post (POSBINDU) Implementation

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## 1 Missed Opportunities in Hypertension Risk Factors Screening in Indonesia: A Mixed-methods 2 Evaluation of Integrated Health Post (POSBINDU) Implementation

3 Vitri Widyaningsih<sup>1</sup>, Ratih Puspita Febrinasari<sup>1</sup>, Eti Poncorini Pamungkasari<sup>1</sup>, Yusuf Ari Mashuri<sup>1</sup>,  
4 Sumardiyono<sup>1</sup>, Balgis<sup>1</sup>, Jaap Koot<sup>2</sup>, Jeanet Landsman-Dijkstra<sup>2</sup>, Ari Probandari<sup>1</sup> on behalf of Scaling Up Non-  
5 Communicable Disease Intervention in South East Asia (SUNISEA) Project

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### 12 Abstract

13 **Objectives:** To assess the implementation and contextual barriers of POSBINDU, a community-based  
14 activity focusing on screening of Non-Communicable Diseases (NCDs), mainly hypertension and  
15 diabetes, in Indonesia.

16 **Design:** This was a concurrent mixed-methods study, with a cross-sectional analysis of secondary data  
17 and Focus Group Discussions on stakeholder of POSBINDU.

18 **Setting:** The study was conducted in seven districts in three provinces in Indonesia, with  
19 approximately 50% of the Primary Health Care (PHC) were selected as areas for data collection (n  
20 PHC=100).

21 **Participants:** From 475 POSBINDU sites, we collected secondary data from 54,224 participants. For  
22 the qualitative approach, 21 focus group discussions (FGDs) and 2 in-depth interviews were held  
23 among a total of 223 informants.

24 **Primary outcomes and measures:** Proportion of POSBINDU visitors getting the hypertension  
25 screening and risk factors' assessment, and barriers of POSBINDU implementation.

26 **Results:** Out of the 114,581 POSBINDU visits by 54,224 participants, most (80%) were female and  
27 adults over 50 years old (50%) showing a suboptimal coverage of male and younger adults.  
28 Approximately 95.1% of visitors got their blood pressure measured during their first visit; 35.3% of  
29 whom had elevated blood pressure. Less than 25% of the visitors reported to be interviewed for NCDs  
30 risk factors during their first visit, less than 80% had anthropometric measurements, and less than 15%  
31 had blood cholesterol examinations. We revealed lack of resources and limited time to perform the  
32 complexities of activities and reporting as main barrier for effective hypertension screening in  
33 Indonesia.

34 **Conclusions:** This study showed missed opportunities in hypertension risk factors screening in  
35 Indonesia. The barriers include a lack of access and implementation barriers (capability, resources,  
36 and protocols).

37 **Keywords:** Non-communicable diseases, hypertension, screening, community-based program

### 38 Article Summary

#### 39 Findings

1  
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3 41 In a mixed-methods study, we found suboptimal implementation of POSBINDU which reflected the  
4 42 missed opportunities in screening for hypertension and its risk factors in Indonesia. Several barriers  
5 43 include suboptimal coverage, complexities of activities and overlap between different NCD-related  
6 44 programs, and lack of resources.

### 8 9 45 **Implications**

10 46 There is a need to improve coverage and implementation of POSBINDU for screening for hypertension  
11 47 and its risk factors. An integrated approach to improve the implementation of hypertension screening,  
12 48 from guidelines to practice is crucial.

### 14 15 49 **Strengths and Limitations of this study**

- 16  
17 50 • This was a relatively large evaluation of POSBINDU in Indonesia, with almost two years of data.  
18 51 • The findings from mixed-methods study provide more comprehensive information on POSBINDU  
19 52 implementation  
20 53 • Information on the contextual factors of POSBINDU implementation can provide insights into  
21 54 steps to improve POSBINDU in the communities.  
22 55 • The use of secondary data poses variations in blood pressure and anthropometrics  
23 56 measurements.  
24 57 • The study limitation also includes the difficulty in differentiating whether the missed reporting  
25 58 was due to lack of activities or lack of reporting. Nevertheless, both the activities and reporting  
26 59 are important in NCDs screening, particularly in the follow up.

### 29 30 60 **Introduction**

31 61 The increasing trends of Non-Communicable Diseases (NCDs) in the world, including Indonesia,  
32 62 require targeted and specific primary and secondary prevention.[1,2] Hypertension, one of the most  
33 63 common NCDs, has a relatively high (33.4%) prevalence in Indonesia.[3][4] This figure is estimated to  
34 64 increase even further with the changing (more sedentary) lifestyle, unhealthy diet, rising prevalence  
35 65 of obesity, and the increasing life expectancy.[5] In 2015, hypertension attributed to 41% of all  
36 66 disability-adjusted life-years (DALYs) lost, and was the leading risk factor for cardiovascular  
37 67 diseases.[6] Economically, hypertension accounts for \$370 billion in medical costs per year  
38 68 worldwide.[7] Major modifiable risk factors for NCDs include smoking, alcohol consumption,  
39 69 unhealthy diet and obesity, and a sedentary lifestyle.[8,9] With the heavy burden and the economic  
40 70 cost of this disease, primary and secondary prevention for hypertension and its risk factors become  
41 71 very important.

42 72 In 2010, the WHO has recommended the implementation of Package of Essential Interventions for  
43 73 Non-Communicable (PEN) Diseases for low- and middle-income countries.[10] In response, the  
44 74 Ministry of Health (MOH) in Indonesia launched the Integrated Health Post (POSBINDU), as part of the  
45 75 PEN program. POSBINDU, a community-based program for hypertension screening and  
46 76 prevention[11], was added to the several existing NCD-related programs Indonesia. These include  
47 77 Prolanis (Program Pengendalian Penyakit Kronis), a community-based hypertension and diabetes  
48 78 management program affiliated with primary care[12] and Posyandu Lansia, a community-based NCDs  
49 79 screening and management for the elderly.[13] Despite these efforts, the awareness and control of  
50 80 hypertension are still relatively low: only 25% of people with elevated blood pressure are aware of  
51 81 their condition, and only 54% of people diagnosed with hypertension take routine  
52 82 medication.[4,14,15] These conditions are still below the “rule of halves” for hypertension  
53 83 management, which recommends that 50% of hypertension patients be aware of their condition, with  
54 84 half of whom should be treated.[16,17]

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3 85 A process evaluation is important in assessing the implementation, to identify barriers, and provide  
4 86 specific recommendations for improvement of POSBINDU. Previous studies have evaluated the  
5 87 effectiveness of the POSBINDU implementation.[11,18] However, they were lacking on the evaluation  
6 88 of contextual barriers in POSBINDU implementation. This study aims to portray the implementation  
7 89 of POSBINDU and its contextual barriers, to provide recommendations for better hypertension and its  
8 90 risk factors screening, and optimal linkage to care in Indonesia.

## 91 **Methods**

### 92 **Setting**

93 POSBINDU is a community-based activity run by community health cadres (volunteers) and supervised  
94 by Primary Health Care (PHC) officials. POSBINDU aims to empower communities in screening for  
95 NCDs and the risk factors, targeting individuals above 15 years old, particularly those of productive  
96 age.[19,20] The main activities include screening for NCDs (mainly hypertension and diabetes) and the  
97 risk factors (i.e., smoking, diet, physical activity, obesity). Further, POSBINDU also provides health  
98 education and facilitate referral to PHC.[19] For this study, we focus on POSBINDU implementation in  
99 screening of hypertension and its risk factor, particularly, since only 30% of hypertensive patients in  
100 Indonesia received formal diagnosis.[15]

### 101 **Study Design**

102 This was a concurrent mixed-methods study in seven districts in three provinces in Indonesia (Central  
103 Java, East Java, and North Sumatra). We purposely selected provinces with relatively high prevalence  
104 of NCDs based on a national health survey conducted in 2018.[21] Cross-sectional study by obtaining  
105 POSBINDU reports were conducted for the quantitative evaluation, whereas case study was  
106 conducted to explore barriers of POSBINDU implementation.

### 107 **Ethnical approval**

108 The study was approved by the ethical review board at Universitas Gadjah Mada, reference number  
109 KE/FK/0648/2019. The participants of Focus Group Discussion gave informed consent before  
110 participating in this study.

### 111 **Data Collection**

112 Within every one of the three provinces, we selected two districts: one city representing urban  
113 communities, and one district representing rural communities. In Central Java, an additional city was  
114 also selected (Figure 1). The rural/urban classification is based on population density and facilities  
115 available in the communities. For each district, approximately 50% of the Primary Health Care (PHC)  
116 were selected as areas for data collection (n PHC=100). Within the PHC, we collected data for  
117 quantitative process evaluation from all active POSBINDU in the areas (n POSBINDU=475). Due to the  
118 different number of POSBINDU within each district or PHCs, the number of POSBINDU visitors as well  
119 as visits varies by the areas. In most POSBINDU, online/electronic data were not available; Hence, data  
120 on participation were manually collected from the POSBINDU register. Data from 2018-2019 were  
121 collected, except for Central Java, in which data were available through September 2019.

122 For the qualitative approach, 21 focus group discussions (FGDs) and 2 in-depth interviews were held  
123 among a total of 223 informants: 22 from Districts Health Department, 101 from Primary Health Care  
124 (PHC) facilities and 100 POSBINDU cadres. The two in-depth interviews were conducted with health  
125 districts department officials. Within each district, we conducted purposive sampling to recruit health  
126 officials responsible for POSBINDU program from the district's health department, and primary health  
127 care. We also recruit 2-3 cadres from each PHC based on list of cadres obtained from PHC officials.  
128 These participants were recruited to obtain information on POSBINDU implementation facilitators and  
129 barriers. The size of the FGDs was on average 10 persons (min 4, max 18). Verbatim transcripts of the



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3 130 FGD's were made for qualitative analyses. The FGD facilitators had public health background and  
4 131 experience in conducting qualitative research. All facilitators attended the preparatory meeting to  
5 132 discuss the FGDs and interview guidelines, to obtain similar perception regarding the aims of FGDs  
6 133 and interviews and items of the FGD guidelines.

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8  
9 134 Insert Figure 1 here

#### 10 135 Outcome and variables measurements

11 136 Missed opportunities in hypertension screening were quantified by the proportion of POSBINDU  
12 137 visitors getting the risk factors anamnesis, and measurement of anthropometric tests, blood pressure  
13 138 and cholesterol. Analyses was conducted on each indicator to provide more detailed information on  
14 139 specific components of screening which were lacking. Sociodemographic variables which were  
15 140 available on the POSBINDU register, were included in the analyses: sex, age, and level of education.  
16 141 Age was classified into several groups based the Indonesian Ministry of Health classification for age  
17 142 (youth = 15-24 years old, adult = 25-44 years old, pre-elderly = 45-59 years old, and elderly => 60 years  
18 143 old). Occupation was not included in the analyses due to high missing value in the POSBINDU reports  
19 144 (>60%).

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23 145 Personal and family history of NCDs were also obtained, which include seven (7) diseases:  
24 146 hypertension, diabetes, heart disease, stroke, asthma, cancer, and high blood cholesterol. Complete  
25 147 personal/family history variables were coded 1 if all information was available and coded 0 if at least  
26 148 one of the disease histories was missing. Any personal/family history variables were coded 1 if at least  
27 149 one of the disease histories was available and coded 0 if all of the history information was missing.

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30 150 We also generate variable "incomplete information" which represent whether the individual received  
31 151 the recommended procedure (history taking, anthropometric measurement, blood pressure  
32 152 measurement, and blood examination). The proportion presented in the analyses, described the  
33 153 individuals who did not receive the complete recommended procedure.

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36 154 We used the logic model framework for process evaluation to assess the implementation of  
37 155 POSBINDU. We adopted several indicators from the current literature on the use of logic model in  
38 156 process evaluation of community-based health intervention. [22–24] The FGDs theme as well as  
39 157 indicators of the secondary data developed based on the literature, were discussed with officials from  
40 158 health department and PHC officials in one pilot site for finalization. We further explored the barriers  
41 159 of POSBINDU implementation using a qualitative approach.

#### 42 160 Analyses

43  
44 161 Statistical analyses were conducted using STATA, to calculate the proportion of activities and  
45 162 outcomes. We further conduct Chi-square, T-test, and ANOVA to assess the statistical significance of  
46 163 the differences. Analyses were conducted on missing information, reflecting whether specific  
47 164 procedure in POSBINDU were carried out and reported. Further analyses on proportion of  
48 165 hypertension and BMI status were also conducted. The two indicators were reported due to relatively  
49 166 high availability of these data (92% and 76%) compared to other indicators. Verbatim transcript from  
50 167 FGDs and in-depth interviews recordings were analysed. Content analysis was applied for the  
51 168 qualitative data to ascertain barriers for the POSBINDU implementation in Indonesia by two  
52 169 independent researchers. To enhance trustworthiness, we assess barriers of POSBINDU from several  
53 170 sources for triangulation purposes: health and PHC officials to reflect implementer's perspective, and  
54 171 cadres to reflect implementers and users' perspective. During data analyses, we also discuss the  
55 172 findings with representative of the FGD participants, i.e., member checking. Parallel analyses were  
56 173 conducted to synthesize the findings from the quantitative and qualitative approaches. Weaving

174 technique, analysing the quantitative and qualitative findings together by theme or concept, was used  
175 to integrate the findings.[25]

### 176 Patients and public involvement

177 Patients or the public were not directly involved in the design, or conduct, or reporting, or  
178 dissemination plans of our research.

## 179 Results

### 180 Participation of community for hypertension screening in POSBINDU

181 Data from 114,581 POSBINDU visits (54,224 participants) were analysed. The findings showed similar  
182 patterns in the districts and provinces: more female and elderly participants. Approximately 80% were  
183 female participants, with the highest proportion of female participants in rural North Sumatra (95.5%).  
184 Meanwhile, in Java, a higher proportion of female participants were observed in urban areas (Table  
185 1).

186 Table 1. Characteristics of POSBINDU Participants within the Three Provinces in Indonesia  
187 (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total
	Rural	Urban	Rural	Urban	Rural	Urban	
Number of individuals	5,103	10,999	23,053	4,983	3,398	6,688	54,224
Number of PHC	11	23	29	9	11	17	100
Number of POSBINDU	38	38	283	27	27	62	475
<b>Categorical (% SE)</b>							
Female	95.5 (0.3)	71.3 (0.4)	76.2 (0.3)	86.7 (0.5)	73.7 (0.8)	88.2 (0.4)	79.4 (0.2)
Age							
15-24	8.7 (0.4)	6.1 (0.3)	6.2 (0.2)	7.8 (0.4)	13.3 (0.7)	3.8 (0.3)	6.7 (0.1)
25-44	38.1 (0.8)	24.9 (0.5)	33.0 (0.3)	48.7 (0.8)	47.7 (1.0)	28.9 (0.7)	22.2 (0.2)
45-59	30.7 (0.7)	37.6 (0.6)	33.2 (0.3)	31.0 (0.6)	30.1 (0.9)	42.4 (0.7)	24.8 (0.2)
>60	22.4 (0.6)	31.3 (0.6)	27.6 (0.3)	12.5 (0.5)	8.9 (0.6)	24.9 (0.6)	24.7 (0.2)
Education**							
PS	2.6 (0.2)	15.3 (0.3)	57.3 (0.3)	50.5 (0.7)	41.1 (0.8)	25.2 (0.5)	38.0 (0.2)
HS	0.3 (0.07)	0.7 (0.1)	0.3 (0.0)	1.3 (0.2)	2.3 (0.3)	1.8 (0.2)	0.8 (0.0)
Univ	0.0 (0.0)	2.7 (0.2)	0.4 (0.04)	4.9 (0.3)	4.9 (0.4)	2.1 (0.2)	1.8 (0.1)
Missing	97.1 (0.2)	81.4 (0.4)	41.9 (0.3)	43.3 (0.7)	51.8 (0.9)	70.8 (0.6)	59.4 (0.2)
Number of visits							
1 time	87.0 (0.4)	77.4 (0.3)	68.4 (0.3)	65.6 (0.7)	84.5 (0.6)	56.4 (0.6)	71.2 (0.1)
2-6 times	12.9 (0.5)	21.7 (0.3)	21.1 (0.2)	23.9 (0.6)	13.3 (0.6)	35.1 (0.6)	22.0 (0.1)
7-12 times	0.1 (0.0)	0.6 (0.1)	6.3 (0.2)	6.0 (0.3)	2.1 (0.2)	5.9 (0.3)	5.3 (0.1)
>12 times	0 (0.0)	0.2 (0.1)	4.1 (0.1)	4.5 (0.3)	0.1 (0.0)	2.6 (0.2)	1.4 (0.1)
<b>Continuous (mean, SE)</b>							
Age	46.4 (0.2)	51.7 (0.2)	49.7 (0.1)	43.4 (0.2)	41.0 (0.3)	50.4 (0.2)	48.6 (0.8)
Number of visits	1.2 (0.8)	1.4 (0.1)	2.5 (0.2)	2.7 (0.5)	1.4 (0.2)	2.5 (0.3)	2.1 (0.1)

188 Notes:

189 Within province, rural-urban comparisons are significant at 0.05

190 Between provinces comparisons are significant at 0.05  
 191 Differences in proportion tested using Chi squares  
 192 SE= standard error  
 193 \*\*Education = HS (High school) PS (Primary school/less) Univ (University/college), Missing = data  
 194 missing

196 Despite the relatively high missing information on age (n missing= 12,084, or 22.3%), we found that  
 197 the participants were on average of older age, with roughly 50% of participants aged over 45 years  
 198 old, almost 25% were >60 years old (Table 1). The highest proportion of participants >60 years old  
 199 were observed in rural East Java (31.3%), with mean age of 51.7 years old. We measured the youngest  
 200 POSBINDU participants in rural Central Java (mean age 41.0 years old). Meanwhile, the missing  
 201 information on education level were higher (almost 60%), with even higher proportion in North  
 202 Sumatra.

203 In the span of the two years of secondary data collection, we found that, on average, the participants  
 204 visit POSBINDU twice, with the lowest average of visits in North Sumatra (rounded to 1  
 205 visit/participant). Approximately 38,628 (71.2%) of participants visit POSBINDU once for two years,  
 206 and 761 (1.4%) visits POSBINDU more than 12 times.

207 Table 2. Missing information and Risk Factors Characteristics within POSBINDU Participants  
 208 (POSBINDU Register, 2018-2019)

Characteristics	North Sumatra		East Java		Central Java		Total %(SE)
	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	Rural %(SE)	Urban %(SE)	
<b>Missing Information in All Visits</b>							
n	6,061	15,774	57,504	13,422	4,925	16,895	114,581
Personal history (complete)	99.3 (0.1)	92.6 (0.2)	67.9 (0.2)	42.5 (0.4)	62.1 (0.7)	95.2 (0.2)	73.8 (0.1)
Family history (complete)	99.4 (0.1)	92.6 (0.2)	65.1 (0.2)	39.7 (0.4)	61.6 (0.7)	95.9 (0.2)	72.1 (0.1)
Personal history (any)	88.2 (0.4)	88.5 (0.3)	56.4 (0.2)	17.2 (0.3)	54.2 (0.7)	91.0 (0.2)	62.9 (0.1)
Family history (any)	97.5 (0.2)	88.9 (0.3)	57.3 (0.2)	28.9 (0.4)	53.5 (0.7)	93.8 (0.2)	65.7 (0.1)
Height	42.7 (0.6)	19.0 (0.2)	15.6 (0.2)	20.7 (0.3)	30.6 (0.7)	23.3 (0.3)	19.9 (0.1)
Weight measurement	35.8 (0.6)	16.0 (0.2)	18.8 (0.2)	5.6 (0.2)	8.9 (0.4)	12.3 (0.3)	16.4 (0.1)
Waist circumference	49.5 (0.6)	36.0 (0.3)	15.6 (0.2)	12.7 (0.2)	36.9 (0.6)	63.6 (0.4)	27.8 (0.1)
Blood pressure	1.8 (0.2)	5.8 (0.2)	9.8 (0.1)	4.6 (0.2)	4.2 (0.3)	6.3 (0.2)	7.4 (0.1)
Blood cholesterol	87.0 (0.4)	80.1 (0.3)	81.9 (0.2)	97.4 (0.1)	91.1 (0.4)	82.0 (0.3)	84.2 (0.1)
Incomplete information	99.6 (0.1)	95.1 (0.2)	98.1 (0.1)	99.6 (0.1)	99.6 (0.1)	99.6 (0.1)	98.2 (0.1)
<b>Missing Information in First Visits</b>							
n	5,103	10,999	23,053	4,983	2,298	6,688	54,224
Personal history (complete)	99.2 (0.1)	89.9 (0.3)	72.8 (0.3)	35.1 (0.7)	49.3 (0.9)	92.6 (0.3)	76.3 (0.2)
Family history (complete)	99.3 (0.1)	89.8 (0.3)	71.3 (0.3)	41.4 (0.7)	50.9 (0.9)	93.5 (0.3)	76.4 (0.2)
Personal history (any)	88.2 (0.5)	85.1 (0.3)	58.3 (0.3)	15.3 (0.5)	40.1 (0.8)	86.9 (0.4)	68.3 (0.2)
Family history (any)	97.3 (0.2)	85.2 (0.3)	60.6 (0.3)	30.0 (0.6)	40.1 (0.8)	90.5 (0.4)	65.0 (0.2)

Height	41.8 (0.7)	19.0 (0.4)	14.8 (0.2)	21.1 (0.6)	20.4 (0.7)	23.0 (0.5)	20.1 (0.2)
Weight	35.3 (0.3)	15.0 (0.3)	16.7 (0.2)	47.6 (0.3)	7.2 (0.4)	12.9 (0.4)	15.9 (0.1)
Waist circumference	48.9 (0.7)	33.6 (0.4)	11.1 (0.2)	12.9 (0.5)	23.0 (0.7)	66.1 (0.6)	26.9 (0.2)
Blood pressure	1.7 (0.2)	5.4 (0.2)	4.9 (0.1)	5.0 (0.3)	3.2 (0.3)	7.0 (0.3)	4.9 (0.1)
Blood cholesterol	86.1 (0.5)	75.7 (0.4)	76.6 (0.3)	97.9 (0.2)	92.3 (0.4)	79.1 (0.5)	80.6 (0.2)
Incomplete information	99.6 (0.1)	93.0 (0.2)	96.7 (0.1)	99.7 (0.1)	99.4 (0.1)	99.4 (0.1)	97.01 (0.1)
<b>Risk Factors Screening in All Visits</b>							
n	3,423	12,015	45,108	10,484	3,374	12,750	87,154
<b>BMI</b>							
Normal	48.3 (0.9)	48.2 (0.5)	51.3 (0.2)	44.6 (0.5)	52.3 (0.9)	46.4 (0.4)	49.3 (0.2)
Underweight	4.9 (0.4)	4.5 (0.2)	8.0 (0.1)	4.5 (0.2)	9.1 (0.5)	3.8 (0.2)	6.3 (0.1)
Overweight	31.9 (0.8)	34.4 (0.4)	30.8 (0.2)	34.7 (0.4)	29.1 (0.8)	34.2 (0.4)	32.3 (0.2)
Obese	14.9 (0.6)	12.9 (0.3)	10.0 (0.3)	16.3 (0.4)	9.4 (0.5)	15.7 (0.3)	12.1 (0.1)
n	5,942	14,835	51,784	12,773	4,717	15,814	105,865
Hypertension	35.4 (0.6)	28.0 (0.4)	42.5 (0.2)	33.7 (0.4)	25.6 (0.6)	35.9 (0.4)	37.2 (0.1)
<b>Risk Factors Screening in First Visits</b>							
n	2,925	8,440	18,820	3,850	2,678	5,078	41,791
<b>BMI</b>							
Normal	49.3 (0.9)	48.0 (0.5)	51.5 (0.4)	45.3 (0.8)	52.4 (1.0)	44.4 (0.7)	49.3 (0.2)
Underweight	4.8 (0.4)	4.5 (0.2)	7.7 (0.2)	5.1 (0.4)	10.1 (0.6)	4.2 (0.3)	6.3 (0.1)
Overweight	32.0 (0.9)	34.2 (0.5)	30.4 (0.3)	33.3 (0.8)	28.7 (0.9)	35.1 (0.7)	32.0 (0.2)
Obese	13.9 (0.6)	13.3 (0.4)	10.4 (0.2)	16.3 (0.6)	8.8 (0.5)	16.3 (0.5)	12.4 (0.2)
n	5,008	10,379	21,858	4,725	3,288	6,201	51,459
Hypertension	34.5 (0.7)	28.5 (0.4)	40.5 (0.3)	31.6 (0.7)	25.1 (0.8)	37.9 (0.6)	35.3 (0.2)

## Notes:

Within province, rural-urban comparisons are significant at 0.05

Between provinces comparisons are significant at 0.05

Differences in proportion tested using Chi squares

SE= standard error

We further observed the relatively high missing information for screening in POSBINDU across the districts, with the following general pattern. First, a relatively high proportion of missing information concerning the personal and family history, with East Java having the lowest proportion. Second, a relatively lower proportion of missing data on anthropometric measurements (less than 50%). Third, in all seven districts, the highest proportion of available data were for blood pressure measurements, followed by weight and height information. Last, our analysis identified higher missing values for blood cholesterol measurements (84,2%). For all measurements, there were significant differences between the three provinces, as well as between the rural and urban areas within the provinces (Table 2).

Based on available data, we found that obesity seems to be more prevalent in urban areas in Java, but relatively similar between rural and urban areas in North Sumatra. In contrast, hypertension was more prevalent in a rural area for East Java and North Sumatra but was more common in urban districts of Central Java (Table 2). However, these data should be interpreted cautiously due to the relatively high missing data on the measurements.

229 **Barriers for the screening of hypertension in POSBINDU**

230 The qualitative data supported the quantitative finding about lacking participation of male and  
 231 younger population in POSBINDU. In the FGDs, cadres and health officials stated the barriers for male  
 232 and younger participants to attend POSBINDU, including the inconvenience of POSBINDU schedule, as  
 233 well as low awareness for hypertension screening (Table 3).

234 Table 3. Qualitative analyses of Focus Group Discussion amongst POSBINDU Cadres, Primary Health  
 235 Care and Health Department Officials

Themes	Category	Codes
Suboptimal target population and gap in policy	Participants' characteristics	Younger adults rarely participate
		Lack of male participants
	Barrier to participations	Schedule incompatibility
		Low awareness for screening
		Lack of role model for screening
	Ineffective policy and coordination	Lack of prioritization for NCD
		Implementation gap of national policy/program at the local level
		The need for coordination with different stakeholders
		The need for coordination among NCD-related programs
	Lack of human resources in terms of capability and quantity for hypertension screening	Cadres have multiple tasks, with time constraints
Cadres are volunteers with other obligations		
Cadres' competencies		Lack of knowledge on hypertension and other NCD
		Lack of ability to conduct measurements and provide health education
		Lack of ability to conduct recording and reporting
Lack of NCD program officers for supervision and reporting		Lack of NCD program officers at PHC
		Most program officers are responsible for multiple tasks/programs
		Lack of reporting officers
Provision of Referral Counselling		The participant with hypertension is not always referred to PHC
		Lack of counseling to participants before the referral made
		POSBINDU has referral form, but rarely used
		Treatment for the referral is covered by their health insurance
Lack of resources for hypertension screening and prevention		Equipment for hypertension screening
	Equipment maintenance is inadequate	
	Limited logistics for cholesterol measurement	
	Lack of budget	POSBINDU is funded by the government, stakeholder (private sectors) or community
		Lack of budget for POSBINDU activities

		Lack of budget for cadres training and incentives
	Health education material	Lack of health education materials
	Infrastructure for recording and reporting	Not all cadres have laptops
		Limited internet connection in some areas
		Most POSBINDU stations use manual reporting
Time constraints for implementation based on MOH standard	The complexity of activities and time limitation	The time required for examination is too long
		Too many information needs to be asked and filled out
		The referral form is rarely used
	The complexity of reporting forms	Many forms need to be filled, while time is limited
		A simplified form in checklist format is preferred

236

237 The need for role model from community leader to improve participation and the barrier for  
238 participation, particularly among males is highlighted by these quotes:

239 *"Yes, we don't have a lot of men (participants), because they are working "* (Cadre, FGD#21)

240 *"In our POSBINDU, the awareness for early screening is still low. Only several people come (to*  
241 *POSBINDU), younger people don't want to come because (POSBINDU is conducted) during*  
242 *working days"*(Cadre, FGD#3)

243 *"...Socialization for this (POSBINDU) is needed, often, the community leader in our area don't*  
244 *want to participate because they are afraid to be screened"* (Cadre, FGD#2)

245 *"... when I asked the communities, why they did not come to POSBINDU, or why there were only*  
246 *few people, they said because I (the community member) were not sick, so why do I need to get*  
247 *(health) check-up (?). So, they were not aware that POSBINDU is not only for those who are sick"*  
248 *(Health official, FGD#19)*

249 *"I asked POSBINDU (participant), why elderly? Where are the younger population? And they*  
250 *said that the young stayed at home because they were embarrassed if they have diseases...*  
251 *"(Health official, FGD#16)*

252 Lack of priority and overlap of NCD-related programs also contribute to a suboptimal target population  
253 of POSBINDU, as illustrated by the following quote:

254 *"(NCD) is not a priority program, hence, there's a lack of commitment between the superior*  
255 *(health department) with the program officials, for example."* (Health official, FGD#7)

256 *"... (different department in) the Ministry of Health focus on specific diseases, such as diabetes*  
257 *and cancer... However, in the community, (the programs) become general. (We) run Polindes,*  
258 *(Posyandu) Lansia, POSBINDU, School Health Program (Types of community based public*  
259 *health programs in Indonesia). In my opinion, the regulation is rigid and detailed, but the*  
260 *implementation is mixed (overlap). If we want to give optimum results, it takes efforts."*  
261 *(Health official, FGD#10).*

262 Several barriers for implementation were revealed. The cadres and health officers often have to run  
263 several different programs. The FGDs also revealed a lack of capability of cadres to conduct  
264 measurements for hypertension screening, providing health education, and also conducting the

1  
2  
3 265 recording and reporting of the POSBINDU activities and measurements. The informants also  
4 266 mentioned a lack of resources, including budget, equipment, and logistics to conduct all the  
5 267 measurements.

7 268 *"One person can hold 5 positions in PHC activities... POSBINDU cadres, Posyandu Lansia cadres,*  
8 269 *and other programs. "(Cadre, FGD#11)*

10 270 *"(cadres of) POSBINDU do not have laptop nor cell phone for the reporting application (of*  
11 271 *POSBINDU), hence, we report to PHC manually" (Cadre, FGD#14)*

13  
14 272 The barriers also include the complexities of the activities and measurements, as well as extensive  
15 273 reporting forms, which require a long time to be completed.

16  
17 274 *"...it takes a long time, because of the measurements and stages (of POSBINDU activities) "* (PHC  
18 275 *officer, FGD#8)*

19  
20 276 *"...POSBINDU report is too time-consuming, because it is long (detail), including identity, cell*  
21 277 *phone number, address, and others... and it has to be filled out every month."* (PHC officer,  
22 278 *FGD#6)*

23  
24 279 Interestingly, in several districts, we found the implementation of mobile POSBINDU, moving from  
25 280 one community to the other within the same subdistricts.

27 281 *"Our POSBINDU is mobile, we have ten communities, so every week, we move from one*  
28 282 *community to the next, focusing on people 15-59 years old."* (Cadre, FGD#18)

30 283 We further synthesized the quantitative and qualitative results. We categorised the barriers into three  
31 284 main parts: 1) input, reflecting the target population/coverage of POSBINDU, 2) process, describing  
32 285 the implementation of POSBINDU activities, and 3) output, reflecting the recording and reporting  
33 286 process of POSBINDU (Figure 2). Results show that in both approaches we found lacking participation  
34 287 of male and younger people in POSBINDU. Lack of priority for NCD screening and ineffective  
35 288 coordination among stakeholders, combined with lack of awareness and access might attribute to this  
36 289 finding. The high missed opportunity, particularly in history taking and measurements, were likely due  
37 290 to the complexity of the activities/measurements, as well as lack of resources. The high missing data  
38 291 also stem from the complexity of the forms and lack of capability for online reporting.

40 291  
41  
42 292 Insert Figure 2 here

#### 43 44 293 **Discussion**

45 294 In this study, we revealed missed opportunities in input, activities, and output of POSBINDU  
46 295 implementation in screening for hypertension and its risk factors. Several contextual barriers were  
47 296 identified. The suboptimal coverage was possibly due to lack of priority for NCD screening, lack of  
48 297 awareness and access, and overlap of NCD-related program. The suboptimal activities and reporting  
49 298 were likely caused by a lack of resources, as well as limited time to perform the complexities of  
50 299 activities and reporting according to MOH guideline.

53 300 The missed opportunity to screen male and younger population that we found in this study is  
54 301 particularly concerning. Although the prevalence is lower than of the older population, hypertension  
55 302 prevalence among young Indonesian is still relatively high (28%).[26] While the target population of  
56 303 POSBINDU is listed as those 15 years or older, the elderly are usually targeted in Posyandu Lansia, a  
57 304 community-based screening and management for the elderly population.[27] Awareness is also lower  
58 305 in male and younger adults, signaling the need to screen this population.[3] Ideally, POSBINDU

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2  
3 306 becomes the “gatekeeper” for screening in the community. Hypertensive and diabetic patients were  
4 307 then referred to PHC and joined Prolanis, a community-based activity funded by the health insurance  
5 308 program, for management of chronic diseases patients.[12]

7 309 Furthermore, with a lack of male participation, POSBINDU is missing one of the key target populations  
8 310 for risk factors screening: smokers. Analysis of a national survey in 2014 reported 32% prevalence of  
9 311 smoking, with approximately 40% of males aged 15-55 years old and 14% of male adolescents are  
10 312 current smokers.[28–30] Further, 20% of Indonesia’s total chronic diseases are attributed to smoking,  
11 313 with hypertension as the highest proportion.[31] Screening for hypertension and its risk factors  
12 314 earlier, combined with lifestyle-based interventions effectively avoid future complications.[32,33]

15 315 We also revealed the need to prioritise and reorganise the current NCD-related programs, to address  
16 316 the suboptimal coverage and the overlap. An example of the gap between the national  
17 317 recommendation and local implementation is reflected in the coordination of existing NCD-related  
18 318 programs: POSBINDU, Posyandu Lansia, and PANDU PTM. In the MOH, the PANDU PTM (Pelayanan  
19 319 Terpadu Penyakit Tidak Menular, Integrated Health Services for NCDs) and POSBINDU are regulated  
20 320 under the Directorate for Disease Management, while Posyandu Lansia is under the Directorate of  
21 321 Public Health. Despite the different directorates, the implementation at community level is often  
22 322 conducted simultaneously and often overlap. Reporting, however, is conducted separately. Hence, as  
23 323 previous studies have noted, we also recommend the need of comprehensive and coordinated NCDs  
24 324 prevention program in Indonesia.[34–36]

28 325 The relatively high missed opportunity in screening for hypertension risk factors, as well as  
29 326 sociodemographic characteristics found in this study, portrays suboptimal implementation of  
30 327 POSBINDU. This can be caused by a lack of recording and reporting (monitoring and evaluation fidelity)  
31 328 or lack of measurement (implementation fidelity). In our further elaboration during the FGDs, we  
32 329 found that lack of human resources might contribute to the suboptimal implementation of POSBINDU.  
33 330 Our findings revealed the need to train cadres to improve their skills and efficiency in conducting the  
34 331 measurements and history taking, as well as reporting the measurements. This is in line with findings  
35 332 from Meinema et al (2017 and Abdell-All et al (2018)[37,38]. Our findings also imply the complexities  
36 333 of the activities and reporting of POSBINDU which lead to ineffective implementation. It is important  
37 334 to ensure that valuable screening information can be recorded and followed up, for better  
38 335 intervention. A simplified screening program with integrated reporting is needed.

42 336 In this study, we also discovered lack of financial resources and equipment as barriers to POSBINDU  
43 337 implementation. The integration of POSBINDU and PANDU PTM to the national health insurance  
44 338 scheme might be important to ensure the sustainability of funding for the program. Integration of  
45 339 POSBINDU into the national health insurance can also improve participation of the working  
46 340 population, most of whom are covered by the national health insurance.[39] Previous studies have  
47 341 reported an increase in uptake of service by health insurance membership.[40–42]

50 342 Based on our findings, we identified two main areas that needs to be improved: coverage and  
51 343 implementation of POSBINDU. To improve coverage of POSBINDU, there are two important steps that  
52 344 we recommend. First, an integrated approach with collaboration amongst different programs and  
53 345 directorates to reduce the overlap and simplify the POSBINDU implementation at the PHC and  
54 346 community level. PANDU PTM as the adaptation of WHO PEN,[43] needs to be implemented in a  
55 347 wider scale. Second, redirecting the target population of hypertension screening, to cover also  
56 348 younger and male population. A workplace-based screening program which can address the barriers  
57 349 identified in the qualitative findings is recommended.[44,45] For this younger population, the use of  
58 350 mobile technology for monitoring of risk factors and measurement might be effective. Previous



1  
2  
3 351 studies have reported the effectiveness of mobile health for hypertension screening and risk  
4 352 stratification.[46,47]  
5

6 353 To improve the implementation and components of POSBINDU activities, a simplified algorithm to  
7 354 screen and refer the target population is needed. The algorithm needs to be developed both in the  
8 355 electronic format and manual format to address the different capabilities of community cadres and  
9 356 resources in the community. Simplifying the program and reporting systems will also reduce the  
10 357 workload of PHC and district health officials. Further, a clear algorithm for the referral of “screened”  
11 358 cases to PHC is important. The readiness of the PHCs also needs to be improved to adequately manage  
12 359 the potential surge in referred cases. Lastly, there is a need to integrate hypertension and CVD  
13 360 screening program into the national health insurance system. Hence, ensuring the sustainability of  
14 361 funding and resources of the program. With these approaches, comprehensive screening for  
15 362 hypertension and CVD along the continuum of care might be more effective.  
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19 363 This study has several limitations. First, the proportion of our measures are not reflective for the whole  
20 364 target population of POSBINDU, since the participants were mostly female and of older age. The  
21 365 characteristics of our sample, which are generally older with a higher proportion of females, drive the  
22 366 proportion of risk factors higher than that of the general population in Indonesia. However, this study  
23 367 reflects the current participants of POSBINDU. Second, we used a secondary data collection by  
24 368 POSBINDU cadres, the high number of missing data that we presented in this study, probably stem  
25 369 from two main sources: omissions in reporting or a true lack in measurement/activities. Nevertheless,  
26 370 both the activities and reporting are important in NCDs screening, particularly in the follow-up. The  
27 371 secondary data also prone to measurement bias, particularly, with the variations in POSBINDU  
28 372 measurements by cadres. The Ministry of Health provided guidelines in the measurement for  
29 373 hypertension in POSBINDU, however, the implementation might vary. The high missing information  
30 374 on several sociodemographic characteristics i.e., occupation and education, also limit our ability to  
31 375 conduct multivariable analyses. Another limitation of this study is we have not included the  
32 376 perspective of POSBINDU participants in the FGDs. Instead, we considered the POSBINDU cadres to  
33 377 represents the voice of both the implementers as well as users. However, we include the perspective  
34 378 of the POSBINDU participants as users in the baseline of our prospective data collection (ongoing).  
35 379 The users’ perspective can provide further insights into barriers and facilitators of POSBINDU  
36 380 implementation.  
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41 381 Despite the limitation, there are several strengths of the study: First, to our knowledge, this was the  
42 382 first relatively large evaluation of POSBINDU. Second, the use of a mixed-methods study design, and  
43 383 therefore, providing more comprehensive information on POSBINDU implementation. Third, the  
44 384 study also investigates the contextual factors that should be addressed in the improvement of the  
45 385 community-based hypertension screening program in Indonesia. This study might provide insights into  
46 386 POSBINDU implementation in other areas in Indonesia and can be the basis for further  
47 387 recommendation to improve POSBINDU implementation.  
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## 51 388 **Conclusion**

52 389 This study showed the suboptimal implementation of POSBINDU activities. Particularly, the missed  
53 390 opportunity in screening for hypertension risk factors in Indonesia. The barriers include a lack priority  
54 391 for NCDs, lack of awareness and access for subpopulation, and several implementation barriers:  
55 392 capability, resources, and protocols. An innovative approach to simplify and improve the capacity of  
56 393 POSBINDU is in preparation to optimize the screening and linkage to hypertension care in Indonesia.  
57 394 This study provides evidence-based recommendations in improving the current implementation of  
58 395 POSBINDU, in the Indonesian context.  
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### 396 **Data Statement**

397 The de-identified data from this study is available upon request to the corresponding or first author  
398 pending thorough review of request and adherence to the Indonesian government regulation on  
399 data sharing.

### 400 **Author Contributions**

401 VW, AP, RFP, EP, YM, JK and JLD contributed to the design of the study. VW, A, RFP, EP, YM, B, and S  
402 participate actively in study implementation, including in data collection. VW, YM, S, and RFP analyzed  
403 the quantitative data. AP, EP, and B analyzed the qualitative data. VW, AP, RFP, S, and YM draft the  
404 manuscript with all co-authors revised critically. All authors read and approved the final manuscript.

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407 was co-financed by the Horizon 2020 research program of the European Union, under grant 825026  
408 Scaling Up NCDs interventions in Southeast Asia.

### 409 **Conflict of Interest**

410 None declared

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416 set out in our licence.

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418 We thank SUNISEA project consortium and the district health departments, primary health care staffs  
419 and cadres of POSBINDU in the three provinces, who have contributed to this study.

420 Figure 1. Study Sample Selection

421 Figure 2. Synthesis of the Quantitative and Qualitative Findings

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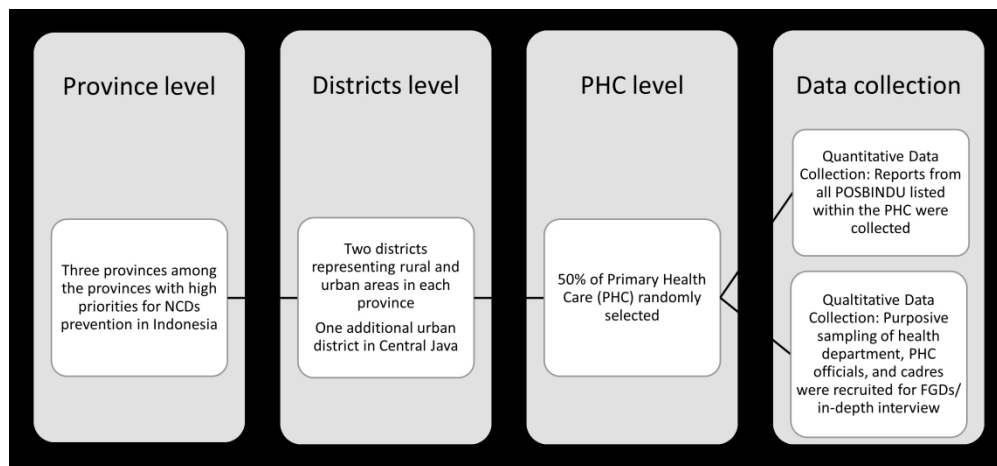


Figure 1. Study Sample Selection

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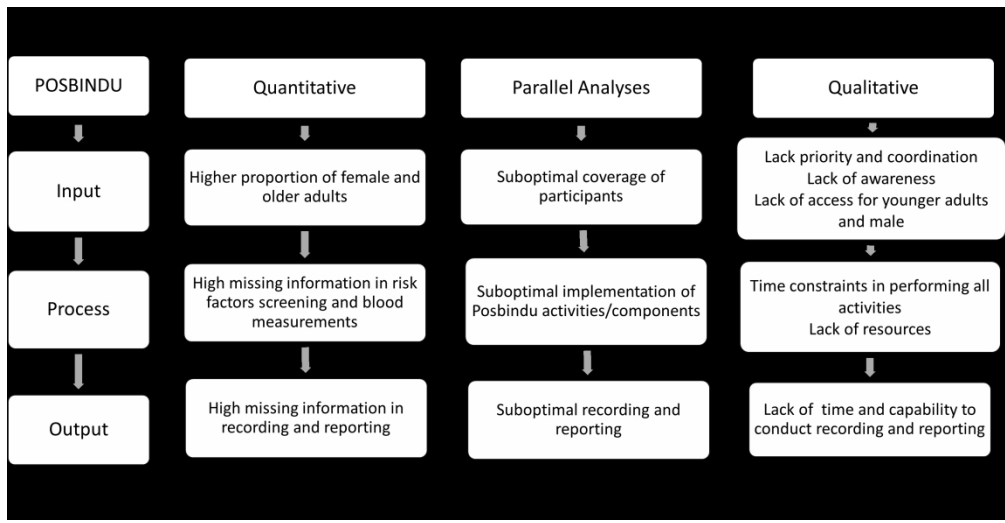


Figure 2. Synthesis of the Quantitative and Qualitative Findings

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	Page 1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Page 2
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 2-3
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	Page 3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 3
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	Page 3
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Page 4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Page 4
Bias	9	Describe any efforts to address potential sources of bias	N/A, descriptive analyses
Study size	10	Explain how the study size was arrived at	Page 3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Page 4
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	Page 4
		(b) Describe any methods used to examine subgroups and interactions	Page 4
		(c) Explain how missing data were addressed	Page 4
		(d) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	N/A
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Page 4
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	Page 4 (referred)
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Page 5
		(b) Indicate number of participants with missing data for each variable of interest	Page 6



Outcome data	15*	Report numbers of outcome events or summary measures	Page 6
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	N/A, descriptive analyses
		(b) Report category boundaries when continuous variables were categorized	Page 5-6
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	Page 10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Page 11
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 12
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Page 12

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# Standards for Reporting Qualitative Research (SRQR)\*

<http://www.equator-network.org/reporting-guidelines/srqr/>

Page/line no(s).

## Title and abstract

<p><b>Title</b> - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended</p>	<p>Page 1/Line 1</p>
<p><b>Abstract</b> - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions</p>	<p>Page 1/Line 14-36</p>

## Introduction

<p><b>Problem formulation</b> - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement</p>	<p>Page 2/Line 53-77</p>
<p><b>Purpose or research question</b> - Purpose of the study and specific objectives or questions</p>	<p>Page 2/Line 80-82</p>

## Methods

<p><b>Qualitative approach and research paradigm</b> - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**</p>	<p>Page 2/Line 98</p>
<p><b>Researcher characteristics and reflexivity</b> - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability</p>	<p>Page 3/ Line 116-119</p>
<p><b>Context</b> - Setting/site and salient contextual factors; rationale**</p>	<p>Page 3/ Line 85-93</p>
<p><b>Sampling strategy</b> - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**</p>	<p>Page 3/ Line 114-121</p>
<p><b>Ethical issues pertaining to human subjects</b> - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues</p>	<p>Page 3/Line 100-102</p>
<p><b>Data collection methods</b> - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**</p>	<p>Page 3/ Line 114-125</p>

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3	<b>Data collection instruments and technologies</b> - Description of instruments (e.g.,	Page 3/Line
4	interview guides, questionnaires) and devices (e.g., audio recorders) used for data	148-150
5	collection; if/how the instrument(s) changed over the course of the study	
6		
7	<b>Units of study</b> - Number and relevant characteristics of participants, documents,	Page 3/ Line
8	or events included in the study; level of participation (could be reported in results)	114-116
9		
10	<b>Data processing</b> - Methods for processing data prior to and during analysis,	Page 3/ Line
11	including transcription, data entry, data management and security, verification of	156-167
12	data integrity, data coding, and anonymization/de-identification of excerpts	
13		
14	<b>Data analysis</b> - Process by which inferences, themes, etc., were identified and	Page 3/ Line
15	developed, including the researchers involved in data analysis; usually references a	158-160
16	specific paradigm or approach; rationale**	
17		
18	Techniques to enhance trustworthiness - Techniques to enhance trustworthiness	Page 3/ Line
19	and credibility of data analysis (e.g., member checking, audit trail, triangulation);	160/163
20	rationale**	

## Results/findings

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23	<b>Synthesis and interpretation</b> - Main findings (e.g., interpretations, inferences, and	Page 7/ Line
24	themes); might include development of a theory or model, or integration with	209-215
25	prior research or theory	
26		
27	<b>Links to empirical data</b> - Evidence (e.g., quotes, field notes, text excerpts,	Page 8/Line
28	photographs) to substantiate analytic findings	218-261
29		

## Discussion

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31		
32	<b>Integration with prior work, implications, transferability, and contribution(s) to</b>	
33	<b>the field</b> - Short summary of main findings; explanation of how findings and	
34	conclusions connect to, support, elaborate on, or challenge conclusions of earlier	
35	scholarship; discussion of scope of application/generalizability; identification of	Page 10/Line
36	unique contribution(s) to scholarship in a discipline or field	279-319
37		
38		Page 11/Line
39	<b>Limitations</b> - Trustworthiness and limitations of findings	353-356
40		

## Other

41		
42		
43	<b>Conflicts of interest</b> - Potential sources of influence or perceived influence on	Page 12/Line
44	study conduct and conclusions; how these were managed	386
45		
46	<b>Funding</b> - Sources of funding and other support; role of funders in data collection,	Page 12/Line
47	interpretation, and reporting	381-383
48		

\*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

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\*\*The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

**Reference:**

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014  
DOI: 10.1097/ACM.0000000000000388

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